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Popular Mechanics Magazine

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VOL. 34 NOVEMBER, 1920 No. 5

THE SUBMACHINE GUN

BY MAJOR A. B. RICHESON

A NEW type of automatic weapon, the submachine gun, which is a machine gun in the form of a pistol, is shortly to appear on the market in the United States, and on the battlefields of Europe. The new application of a scientific principle has enabled the inventors to do away at one sweep with all the numerous heavy and more or less bulky parts required for the operation of other existing types of automatic and machine guns.

The scientific principle invoked is the force of adhesion, which, when called into play by the sudden, heavy bore pressure developed by the firing of a cartridge, causes a small, specially designed wedge, to lock the breech as if in a vise. Then, when the pressure falls below a certain point, the wedge ceases to hold and unlocks the breech, and the operation of the piece automatically continues.

The use of this wedge principle is considered a signal advance in the art of gun making. It results in a weapon small enough to be carried under the coat, yet fully capable of delivering a stream of several hundred shots in a minute. Official tests at a United States armory, and on target ranges, have proven the sturdiness, reliability, accuracy, and all-around satisfactory qualities of the gun. It has few parts, and can readily be dismounted without tools.

Considering the automatic gun as a gas engine, the inventors of the submachine decided it should be oiled like a gas engine, and inserted an oil pad in the breech. Every time

The New Automatic Machine-Gun Small Arm, Seen in Use in the Upper Picture and in Detail in the Lower, Is Remarkable for Its High Rate of Fire, in One Test Discharging a Magazine of 20 Shots in 1.2 Seconds. It Normally Uses Disk Magazines of 50 or 100 Shots. The Breech-Locking Mechanism Is a Simple Wedge Actuated by the Firing Pressure, the Most Significant Feature of the Gun

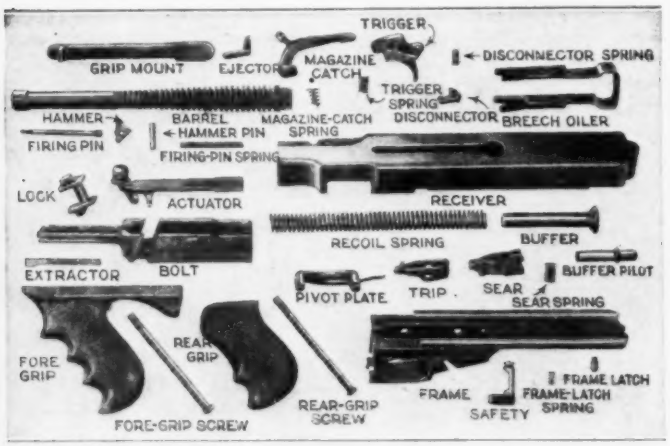
the bolt is kicked back by the operation of the piece, the mechanism is lubricated. At the official test, 2,000 shots were fired with only one malfunction, and the last magazine of 20 shots was fired in 1⅕ seconds. The tremendous rate of fire, and the demonstrated smoothness and reliability of functioning, were attributed to the combination of the simplified breech mechanism and the oiling feature.

The weapon is made in calibers .22, .32, .38, and .45, the last using the United States Army automatic-pistol cartridge, with which very effective work has been done up to 500 yd., and with a special powder, accurate work at 800 yd. The New York Metropolitan Police, and several South American governments have adopted the submachine gun.

Besides the military possibilities of the gun, 50 of which could be mounted on or transported by an airplane, it will have a wide field of usefulness for civil officers.

A stock and sights are provided for semiautomatic fire from the shoulder, but for full automatic fire from the hip no stock or sights are used. The magazines are of the disk type, with capacities of 50 and 100 cartridges.

General John T. Thompson, retired, formerly assistant chief of ordnance, developed and perfected the submachine gun, and has applied its operating principle to high-power rifles and to shotguns.



The Remarkable Simplicity of the New Submachine Gun is Revealed by Its Small Number of Parts, as Compared with the Ordinary Machine Gun. As Explained in the Text, the Insignificant-Looking Lock, Seen in the Left Center, Is the Ingenious Feature of the Weapon

THERMOMETER OF NEW TYPE DESIGNED AS ORNAMENT

A thermometer is not often seen in the well-appointed parlor, library, or office, one American manufacturing concern is convinced, because the ordinary instrument is both unsightly and hard to read. Accordingly the company is now introducing an interesting and attractive thermometer of its own design. The various models

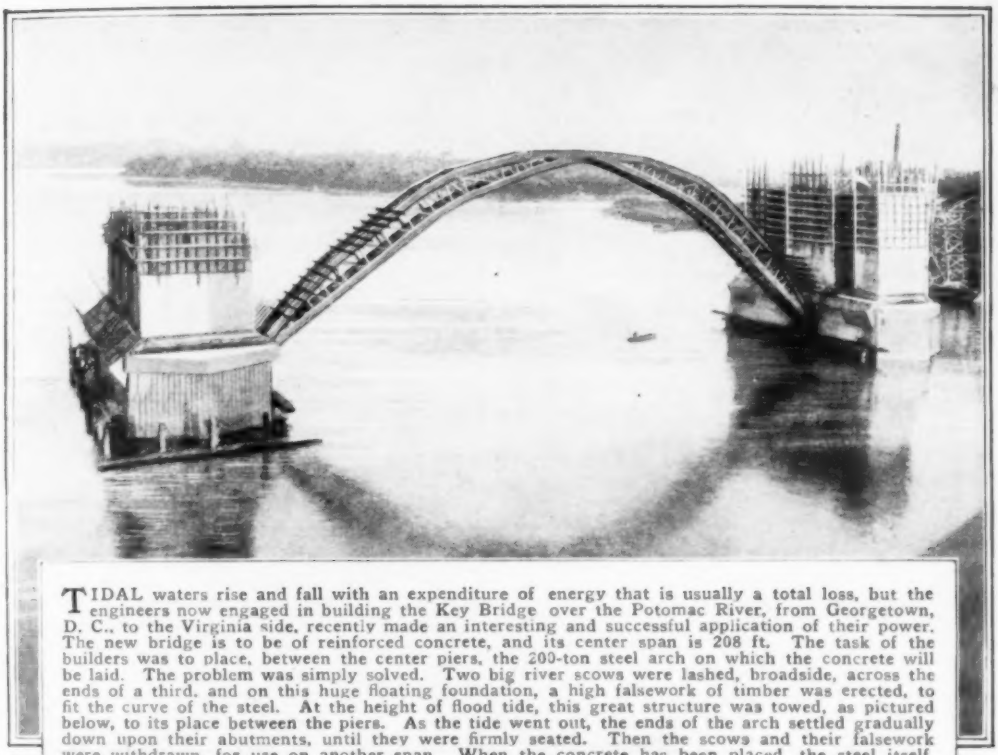
The New Thermometer That Claims a Place in the Living Room by Virtue of Its Ornamental Appearance

are finished in silver, gold, old ivory, old brass, colonial brass, and art metal; but all are mechanically the same. Each mechanism is seen as a dished disk of brass, half the circumference of which is plainly marked off into degrees. From the center of the disk projects a vertical rod which carries a little flag, or vane, and so indicates the temperature. The whole is inclosed by a hemisphere of glass.

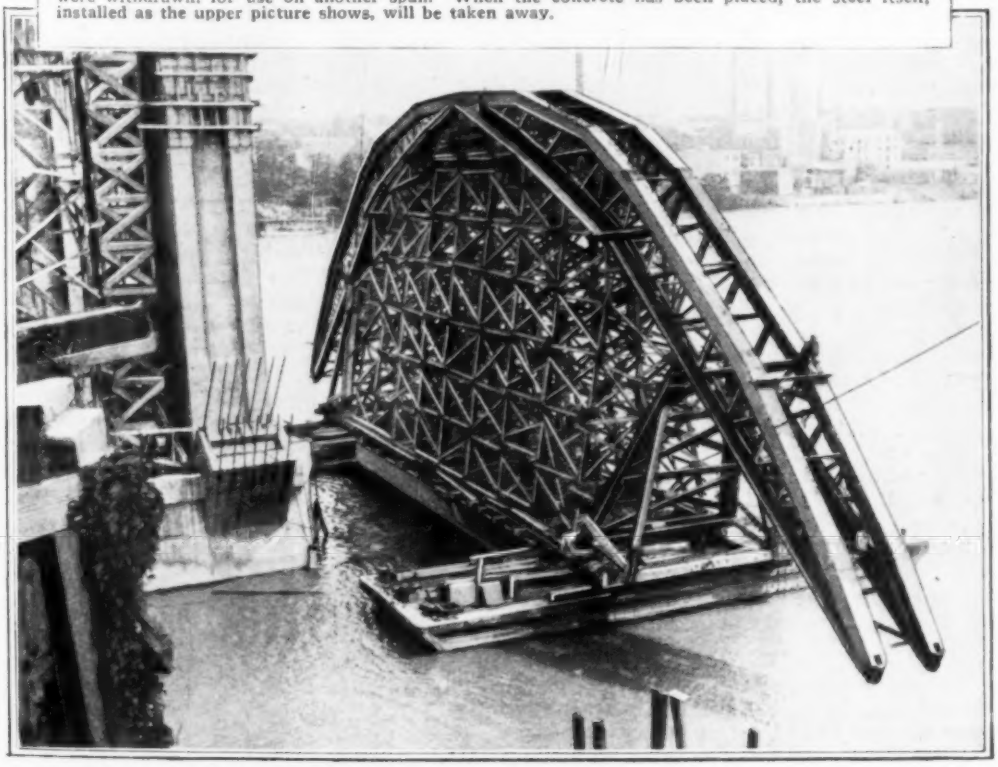
GIRLS IN CANADA WILDERNESS ROW TWO HUNDRED MILES

Down the wild and ragged east shoreline of Lake Winnipeg, Manitoba, where not a farm nor a settlement breaks the desolation, two young women of eastern Canada recently rowed 200 miles in an open boat, taking a month for the trip and making their own camp every night. The collection of fossils, in which the region is rich, was the object of the remarkable journey. A lone Indian was the only human being sighted in the entire distance. The daring voyagers were deposited by a steamer at the mouth of the Berens River, about midway of the lake, and from that point were wholly dependent upon their own resources.

USE TIDE TO INSTALL HUGE STEEL BRIDGE SPAN



TIDAL waters rise and fall with an expenditure of energy that is usually a total loss, but the engineers now engaged in building the Key Bridge over the Potomac River, from Georgetown, D. C., to the Virginia side, recently made an interesting and successful application of their power. The new bridge is to be of reinforced concrete, and its center span is 208 ft. The task of the builders was to place, between the center piers, the 200-ton steel arch on which the concrete will be laid. The problem was simply solved. Two big river scows were lashed, broadside, across the ends of a third, and on this huge floating foundation, a high falsework of timber was erected, to fit the curve of the steel. At the height of flood tide, this great structure was towed, as pictured below, to its place between the piers. As the tide went out, the ends of the arch settled gradually down upon their abutments, until they were firmly seated. Then the scows and their falsework were withdrawn, for use on another span. When the concrete has been placed, the steel itself, installed as the upper picture shows, will be taken away.



MOTORIZED BICYCLE CARRIES SIDECAR FOR INVALID

Improved provision for the comfort of invalids and cripples is one form of current progress that probably owes its impetus to the great war. The old-fashioned wheel chair, laboriously hand-pushed, seems likely at last to become obsolete, as modern propulsive methods are adapted to the new purpose. In a recently designed outfit, the wheel chair takes the form of a sidecar on a light steel frame, which may be attached in a few minutes, by four bolts, to a standard bicycle of either diamond or drop-frame style. Spring suspension and deep upholstering make the side seat comfortable, and if occasion demands, it may be quickly removed and a box body substituted. The addition of a motor wheel to the bicycle frame contributes the final touch of luxury and convenience for both patient and attendant.

The Invalid's Sidecar, Spring-Seated, Fastened to the Bicycle with Four Bolts and Easily Removable

View of the Bicycle Side of the Combination, Illustrating the Manner in Which a Motor Wheel may be Attached to the Rear Framework

¶ During the last year 1,340,000 two-year-old seedlings, chiefly Douglas fir, have been planted in the burned-over areas of the states of Oregon and Washington.

MIRRORS PICTURE MAN'S DEATH IN GAS-FILLED WELL

Foiled by a jutting rock in their efforts to rescue a well driller from the gas-filled bottom of a 74-ft. shaft in northern Illinois a few days ago, a party of his fellow workers resorted to a strange device. A mirror and an electric light were lowered into the depths, and through a second glass, a 6-in. hand mirror, held at the top of the opening, the awed group helplessly watched the gradual effect and final triumph of the deadly fumes.

STEAM-BAG VULCANIZER FOR TIRE REPAIRS

The end of vulcanizing troubles is forecast by the introduction of the steam bag which tends to supplant the air bag in this field. The new method enables a repairman to cure the inside of the tire at the same time the outside cure is being made, in the same mold and all in one operation. This is a factor against overcooked rubber or undercure inside the tire. An additional claim is that the radiation of moist heat increases the life of the rubber. Longitudinal stretching is prevented, and this results in greater pressure against the tire walls than is the case with the air bag, which suffers a loss due to expansion in the direction of its length. The steam bag is inserted into the tire just as in the use of the air bag. A flexible-hose connection is attached, and the steam is turned into the bag by opening a valve. Any condensation in the bag after a cure is made is forced out through small drain-pipes.

Above: The Vulcanizing Steam Bag Complete. Right: The Method of inserting the Bag into a Tire Casing

Left: The Head of Paul Dardé's Colossal Figure "The Faun," Recently Exhibited in Paris. Right: His Masterpiece "Eternal Sorrow," Which Won the French National Prize. The Sculptor Was Formerly a Shepherd

SCULPTOR LEAPS TO FAME FROM SHEPHERD'S HUT

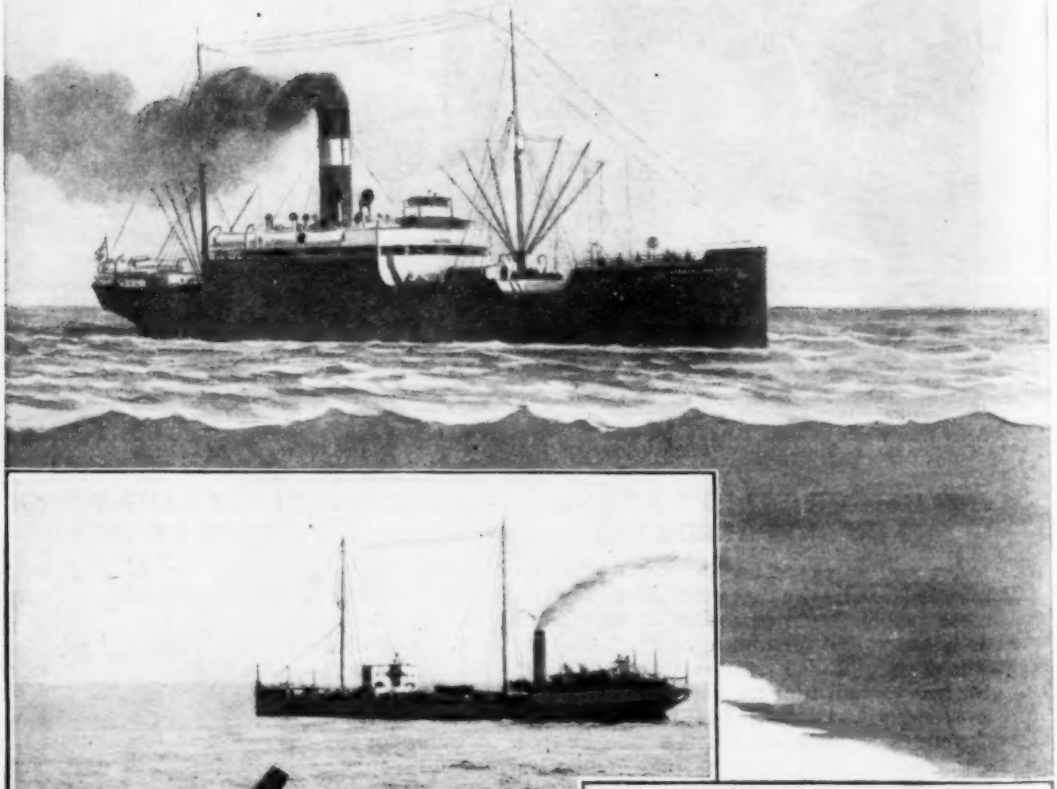
Art and romance are inextricably commingled, and the accomplished artist's most interesting possession is a humble or picturesque beginning. Paul Dardé, whose sculptured studies are causing France to hail him as a new master, was a shepherd, tending his flocks in the Cevennes Mountains, when a well-known artist found him, not long ago, and carried him off to Paris for a short course. His work, declared by admirers to rival that of the great Rodin, is usually hewn directly from the stone, without previous modeling, using ordinary stonemasons' tools. Now 33 years old, he began his untutored chiseling at nine, guided through the years, he says, only by the Bible, Dante, and Shakespeare. Regarded as particularly impressive are his late pieces, the Medusalike "Eternal Sorrow," and "The Faun," a gigantic figure, recently exhibited at the Paris Salon.

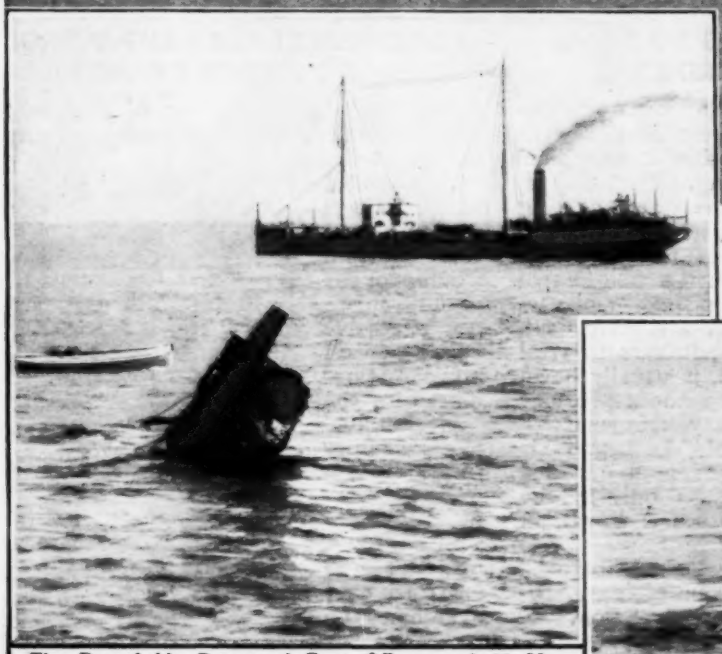
¶An automobile, running 60 miles an hour, was lifted 10 ft. in the air recently in Colorado, when a rope ladder hanging from an airplane, intended to pick up a noted aerial acrobat riding in the car, caught on its rear end. The plane fell, but its pilot escaped with bruises.

PORTABLE FLASH LAMP USING LARGE POWDER CHARGES

Heretofore the securing of flashlight scenes of parades and gatherings of any magnitude has been attended with considerable inconvenience and trouble for the photographer. An excessive charge of powder is required for the explosion, and the difficulty in getting a proper exposure is apparent. A recent arrangement overcomes the foregoing. A 12-in. pan is attached to an 8-ft. pole. In addition to this, the assistant carries a 10-volt battery, which furnishes the current for the explosion of the powder in the pan. The charge is exploded simultaneously with the exposure, by means of a switch in the photographer's hand.

THRILLING EXPLOIT RESCUES CREW

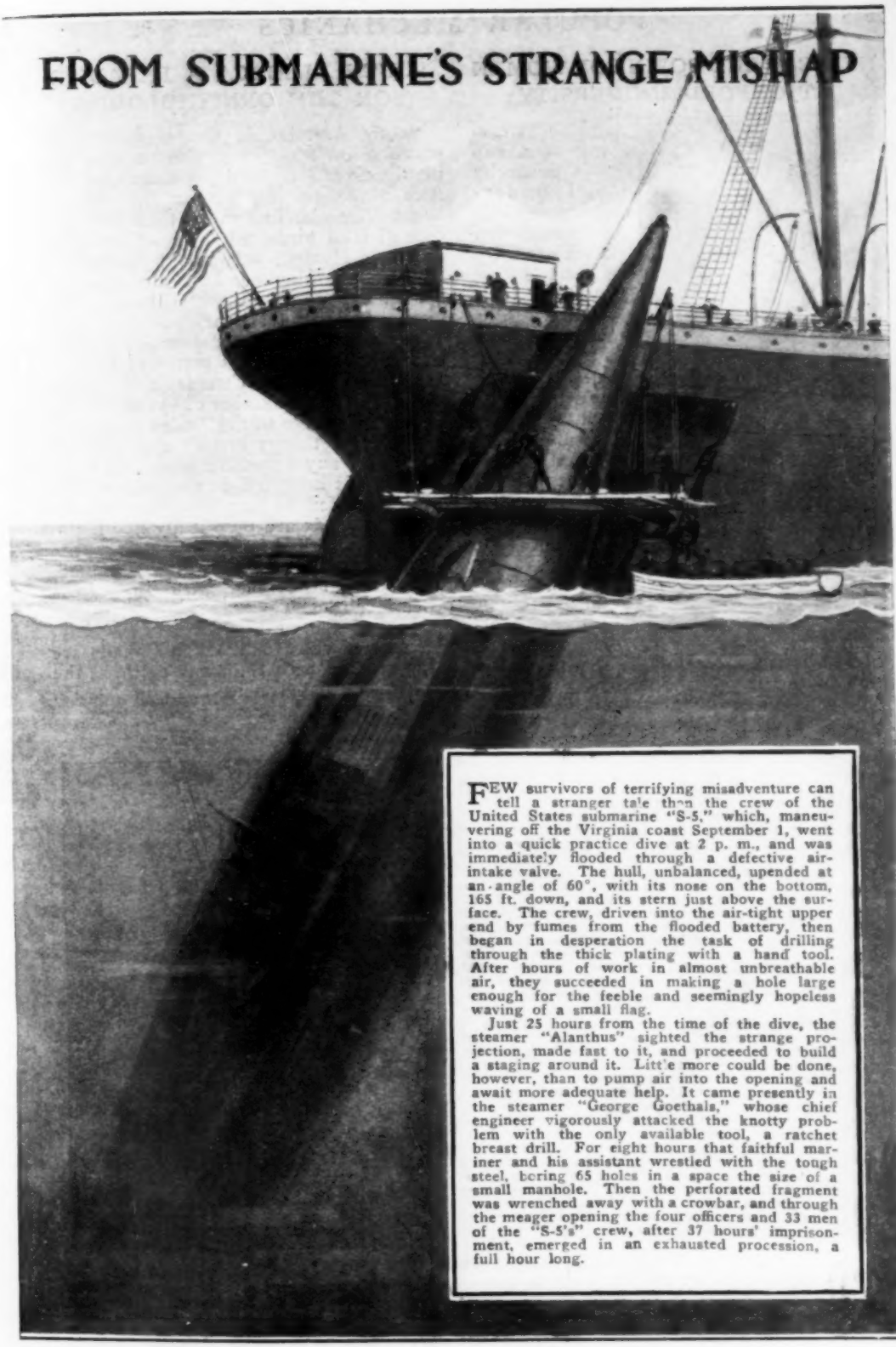




The Remarkable Rescue of Four Officers and 33 Men, through a Small Hole Cut in the Upended Stern of the Submarine "S-5," is Seen in the Large Picture on the Opposite Page. The Sub's Stern has been Made Fast to the Steamer "Atlanthus," While the Steamer "George Goethals," Whose Engineers Effected the Rescue, Stands By at the Left. The Picture Just Above was Taken as the Sub Broke Its Tow and Sank, off the Delaware Capes. The Ship in the Offing Is a Naval Tender

The Last of the "S-5," Which Broke Away from the Battleship "Ohio" on the Way to Port, and Sank in 150 Feet of Water, Shortly after the Rescue

FROM SUBMARINE'S STRANGE MISHAP



FEW survivors of terrifying misadventure can tell a stranger tale than the crew of the United States submarine "S-5," which, maneuvering off the Virginia coast September 1, went into a quick practice dive at 2 p. m., and was immediately flooded through a defective air-intake valve. The hull, unbalanced, upended at an angle of 60°, with its nose on the bottom, 165 ft. down, and its stern just above the surface. The crew, driven into the air-tight upper end by fumes from the flooded battery, then began in desperation the task of drilling through the thick plating with a hand tool. After hours of work in almost unbreathable air, they succeeded in making a hole large enough for the feeble and seemingly hopeless waving of a small flag.

Just 25 hours from the time of the dive, the steamer "Alanthus" sighted the strange projection, made fast to it, and proceeded to build a staging around it. Little more could be done, however, than to pump air into the opening and await more adequate help. It came presently in the steamer "George Goethals," whose chief engineer vigorously attacked the knotty problem with the only available tool, a ratchet breast drill. For eight hours that faithful mariner and his assistant wrestled with the tough steel, boring 65 holes in a space the size of a small manhole. Then the perforated fragment was wrenched away with a crowbar, and through the meager opening the four officers and 33 men of the "S-5's" crew, after 37 hours' imprisonment, emerged in an exhausted procession, a full hour long.

NEW CAP AND GOWN FOR WOMEN AT OXFORD UNIVERSITY

The wearing of a cap and gown by girl undergraduates is a concession recently granted by Oxford University. Both garments are specially suitable for young students. The gown, which is of three-quarter length, is practically a sleeveless jacket. It is very plain, loose-flowing, and apparently quite cool and comfortable. The cap is flexible, in distinct contrast to the usual troublesome and stiff cap, although of similar style.

SOUTH AMERICA A PARADISE FOR THE ORNITHOLOGIST

South America is the ornithologists' paradise on account of the teeming and highly diversified bird population. Costa Rica alone, no larger than the state of West Virginia, has more than 650 species of land birds, while in all America, north of Mexico, only about 500 species have been catalogued. In Andean Colombia an expedition of the American Museum of Natural History secured specimens of over 1,150 different land birds, or more than twice as many as exist in the United States, Canada, and Greenland. This great number of species is said to be attributable to the Andes more than to any other thing; just as, similarly, the absence of any extensive mountain chain in Africa is accepted as the reason why species are few in that continent. South American birds are practically nonmigratory, and are therefore continuously subjected to the influences of their surroundings, and do not mix with birds from other localities.

¶A pair of yaks obtained in Canada are being crossed with Galloway cattle at the government experiment farm in Alaska, with a view to improving local stock.

NAVAL ATHLETES TRAIN AT SEA FOR OLYMPIC GAMES

WHILE en route to the Olympic games at Antwerp, the Navy's contingent of athletes kept in trim by constantly training in an improvised gymnasium on the quarterdeck of the cruiser "Frederick," which carried them to the Belgian port. The quarterdeck was fitted with rowing machines, punching bags, and the like. The shells of the rowing team were carefully wrapped in canvas and placed in a wooden framework, so that they would not be damaged; these can be seen in the middle distance.

A Pneumatic Hand Plane, the Revolving Blades of Which are Driven at High Speed by a Rotor of the Bucket-Turbine Type, Running without Vibration and at Low Pressure

A Turbine-Driven Tool, Similar to a Plane, Used Mainly for Removing Bark from Logs

TURBINE PRINCIPLE APPLIED TO PNEUMATIC HAND TOOLS

By the application of the well-known bucket-turbine principle to pneumatic hand tools, numerous advantages are claimed, not the least of which is the absence of vibration. It is also said that tools of this character are less bulky and operate on much lower air pressure than ordinarily used.

Several types of pneumatically operated planers were devised as a direct result of the war-time demand for wooden ships. One type has a revolving cutter head for finishing wooden hulls, and with it the work of 20 men with jackplanes can be done in a day. Another type of plane, while primarily devised for removing the bark from logs used for ship timbers, has innumerable applications, and as its use eliminates the adz, the possibility of accident is greatly reduced. The turbine-driven drill and valve grinder, owing to lower pressure and greater efficiency, can be operated on the air supply of the average garage.

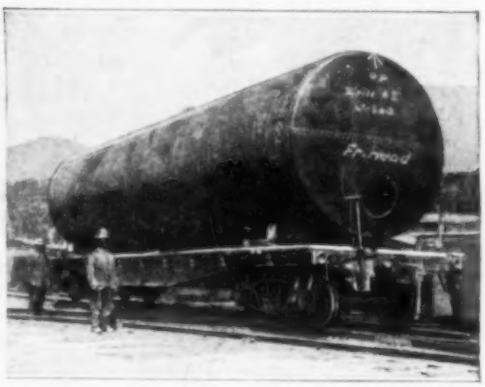
Left: A Hand Drill with Its Turbine Motor at the Top, Usable Also as a Valve Grinder. Right: Smoothing a Log with the Trimming Plane

WINDSHIELD PROTECTS FLAME ON EXPOSED CIGAR LIGHTER

A concessionaire who has his cigar stand on the pier of a western resort, where there is usually a strong wind, has provided his cigar lighter with a windshield. The previous difficulty of getting a "light" has entirely disappeared, and regardless of how hard the wind may be blowing, the flame will not be extinguished.

NEW GASOLINE STILLS SET RECORD FOR SIZE

The gasoline stills that are now being installed on the Pacific coast to relieve the gasoline shortage are the largest yet constructed. An idea of their size may be gained by the fact that they extend the entire length of a flat car. Five of these tanks are 47 ft. in length and hold 40,000 gal., while the remaining eight are 42 ft. long and have a capacity of 25,000 gallons.



One of the Gigantic Gasoline Stills, Full Flat-Car Length, being Taken to the Pacific Coast to Help Relieve Its Motor-Fuel Famine

PLANTING GRAIN FIELDS BY AIRPLANE

By CLEVELAND GAINES

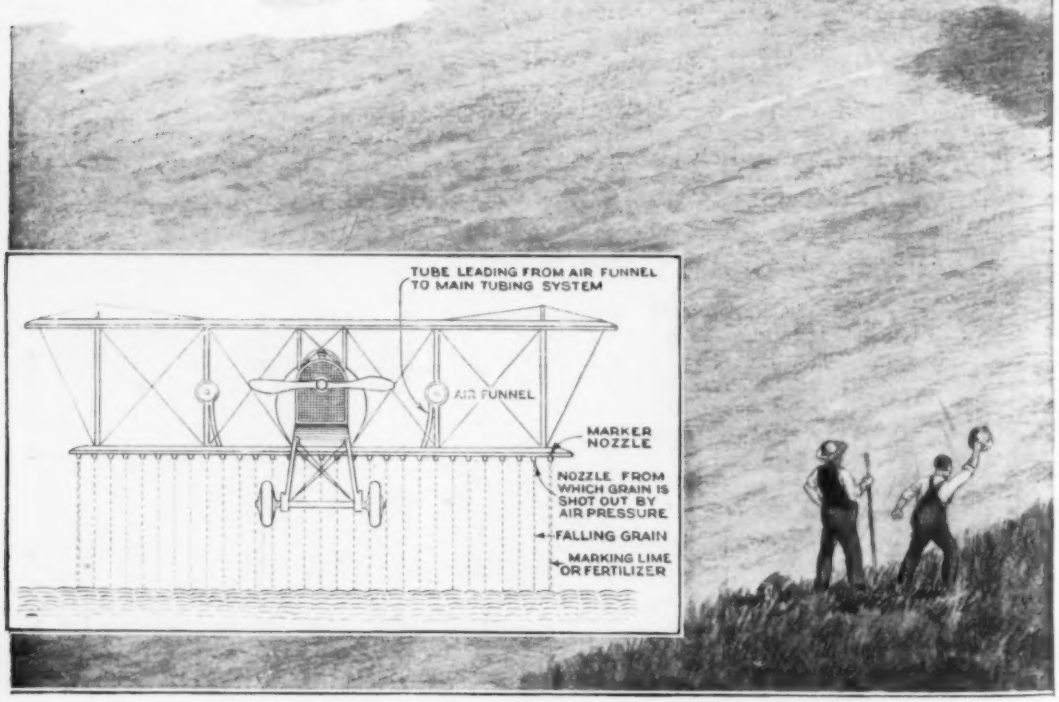
WHETHER or not an agricultural airplane of the general type described in the accompanying article becomes a practical fact is in no wise so important as the significant point of view of the inventor—a man who has been using planes almost daily. Doubtless many untoreseen problems would attend such an adaptation of air craft, but that there is a strong probability of eventual utilizations of this nature will not be gainsaid by any who have followed the development of aerial service closely. Within the past month two great automobile manufacturers have expressed in unhesitant tones their strong confidence in the speedy utilitarian development of the airplane and their belief that many practical-purpose types will be produced in the United States. The "aerial grain sower" hints of these rich possibilities.—Editor.

THAT the airplane, now popularly regarded as chiefly a spectacular means of rapid transit, is destined ultimately to take a place near the top of the growing list of direct mechanical aids to agriculture, is the firm conviction of a certain young officer of the U. S. Air Service. Familiar by early training with farm requirements, and knowing that the average farmer can see, as yet, no promise of help to his industry through the medium of flight, this enthusiastic airman has designed an "aerial grain sower."

This strange machine is an airplane of the slow-speed tractor type, intended to sow grain at flying speed, as it passes over the field. A system of perforated metal tubes laid parallel at short intervals extend from front to back of the lower wings. Out of these tubes the seed is forced by air pressure, created by the flight of the plane itself. It is calculated that the grain can be expelled in this manner with sufficient velocity to bury it to an effective depth in loose, prepared soil. The machine will have a speed of about 40 miles an hour, which is figured on a safe margin over the landing speed. It will be able to climb to a height of two miles, but for planting it is intended to be flown only a few feet above the ground.

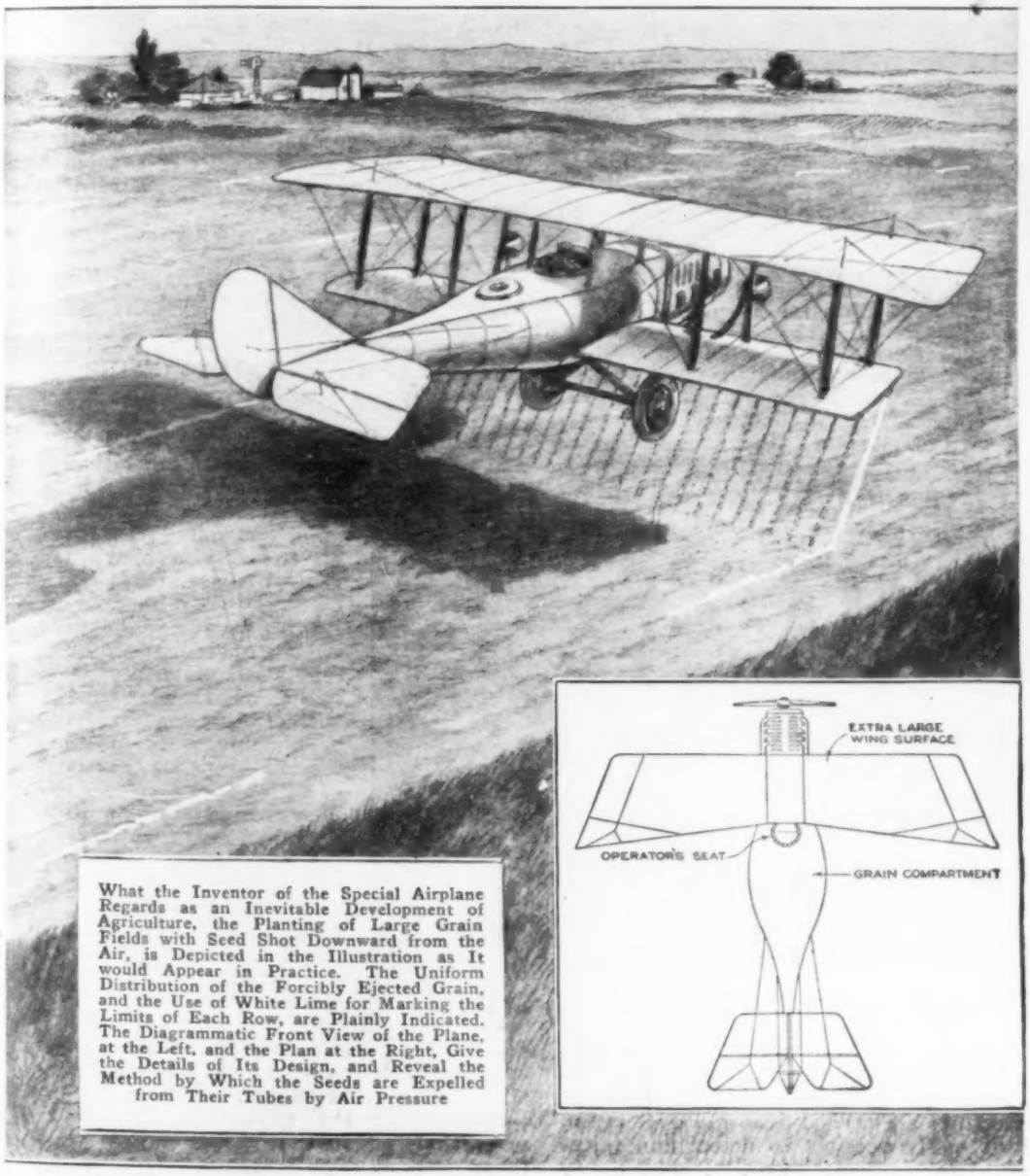
Provision for automatic control of the air pressure which expels the seeds, increasing it as the flying height increases, is made by connection with a sensitive aneroid barometer. But the pressure may also be controlled by the operator, by means of a hand-wheel connected to a check valve. Immediately after a rain, when the soil is soft, the minimum pressure would doubtless be ample.

The landing gear is an important feature of the


TUBE LEADING FROM AIR FUNNEL TO MAIN TUBING SYSTEM
AIR FUNNEL
MARKER NOZZLE
NOZZLE FROM WHICH GRAIN IS SHOT OUT BY AIR PRESSURE
FALLING GRAIN
MARKING LIME OR FERTILIZER

grain-sowing machine, for there would be certain occasions when landing on plowed ground was necessary or expedient. This condition calls for wheels larger than those of ordinary airplanes, and a substantial nose skid to prevent nosing over. The great ground surface that could be covered in a single flight necessitates a roomy fuselage, with capacity for a large amount of grain. The plans specify an over-all length of 40 feet., and a span of 36 ft., with wings built of a strength and depth sufficient to assure a high factor of safety. The power plant is to consist of a 150-hp. motor, using about 9 gal. of gasoline an hour when fully loaded. Less than half this power would be needed, however, with the craft empty.

According to the inventor's figures, a row 36 ft. wide could be planted at each passage of the machine. At the end of each wing tip would be carried a special set of tubing for throwing down a thin stream of white lime, or fertilizer, if de-



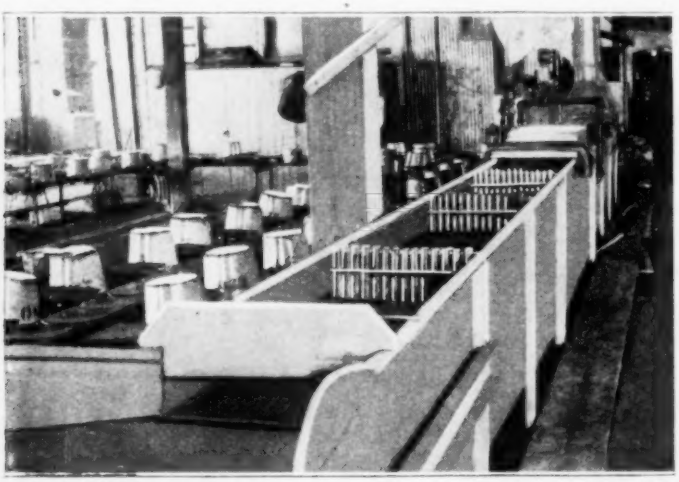
What the Inventor of the Special Airplane Regards as an Inevitable Development of Agriculture, the Planting of Large Grain Fields with Seed Shot Downward from the Air, is Depicted in the Illustration as It would Appear in Practice. The Uniform Distribution of the Forcibly Ejected Grain, and the Use of White Lime for Marking the Limits of Each Row, are Plainly Indicated. The Diagrammatic Front View of the Plane, at the Left, and the Plan at the Right, Give the Details of Its Design, and Reveal the Method by Which the Seeds are Expelled from Their Tubes by Air Pressure

sired, for a marking line to indicate the planted area. Only one of these wing-tip markers need be used at one time, the other being shut off by a simple lever. In making the turns at the end of the field the entire system would be shut off, by closing the air vent to the main tubes. Wide turns would be necessary, of course, in banking close to the ground at low speed, to avoid accident.

Such a machine could be built complete, the inventor estimates, for not to exceed $3,800. Much of the costly bracing necessary to the planes used for stunt flying could safely be eliminated in the construction of this one. Once made practical, the vast saving it would effect in time and labor is obvious. Calculations show that a section of land, containing 640 acres, could be planted in about six hours, flying at 40 miles an hour, and allowing one minute at each end of the field to make the turn and get lined up with the marker. The same acreage, planted with an 8-ft. drill, traveling at the rate of three miles an hour, with one-half minute for the turn, would take one man about 22½ ten-hour working days, or would require 38 men to compete with the six-hour performance of the plane. The cost of teams for such a wholesale sowing, and the wear, tear, and breakage on 38 drills, undoubtedly would greatly exceed the expense of running the plane for six hours. Figuring on an indicated sowing capacity of 1,000 acres a day, it is evident that one machine could adequately serve a large grain-growing district, working on a co-operative, or contract, basis. It is plain also that the mechanical system of such a planting plane might readily be adapted to the sowing of corn, and perhaps other kinds of seed.

TOMATO-GRADING MACHINE FOR CANNING PLANTS

More particular even than a human inspector, a mechanically operated tomato grader for cannery purposes turns the vegetables over so that they can be inspected on all sides as they are sorted. The tomatoes pass underneath three sets of swinging pipes; these are just heavy enough to roll the tomato over as it is carried along by a belt conveyor. An inspector stands at each barrier and, as the tomatoes are turned over and over again, it is easily possible to detect and reject any imperfect specimens. The efficiency of the machine is such that about 80 per cent of the tomatoes are turned over on contact with the swinging barriers.



A Machine for Grading and Inspecting Tomatoes in the Cannery: The Vegetables Travel along an Endless Belt Conveyor for Inspection

SMALLEST AFRICAN PYGMIES STUDIED BY EXPLORER

Pygmies averaging but 4 ft. in height, and therefore several inches smaller than any previously reported, are described by an American explorer who has just returned after nearly a year in central Africa. This exceedingly short race, belonging to the Mambuti tribe already known by reputation to anthropologists, is stooped and apelike in appearance, presumably because of the low-branched forests in which they live. The little people are said to be very brave in attacking large native animals, and will not eat meat that is not killed in the hunt. They do not lie or steal, and are strictly monogamous. The explorer points out, however, that they are not a distinct race, but merely the smallest of a series of tribes of graduated heights, all found in that region. Camera men accompanying the expedition obtained several reels of motion-picture studies of these peoples.

BRICKS OF UNIFORM TEXTURE NOW MADE FROM SLAG

Lack of uniformity in weight and texture, the principal obstacle to the commercial production of building bricks from slag, now has been successfully overcome by American manufacturers, and a new use is created for the accumulations of steel-mill waste. An even, light-gray color is characteristic of the slag brick, which accepts additions of dyes or pigments in any desired shade. The strength of the bricks appears to improve with age, as a sample six days old supported, in a test, a weight of 22,580 lb., while one 6 months old withstood a load of 110,720 lb. Immersion in water showed an absorption of only 8.29 per cent in 48 hours. It is stated that the production of slag from one large steel mill may be sufficient for the daily manufacture of 1,000,000 bricks.

One Aspect of the Otis Monument Shows the Figures of the Deceased Soldier-Publisher and a Soldier Bearing the Flag. Center: The Wooden Inclosure Which Hid the Monument during Construction

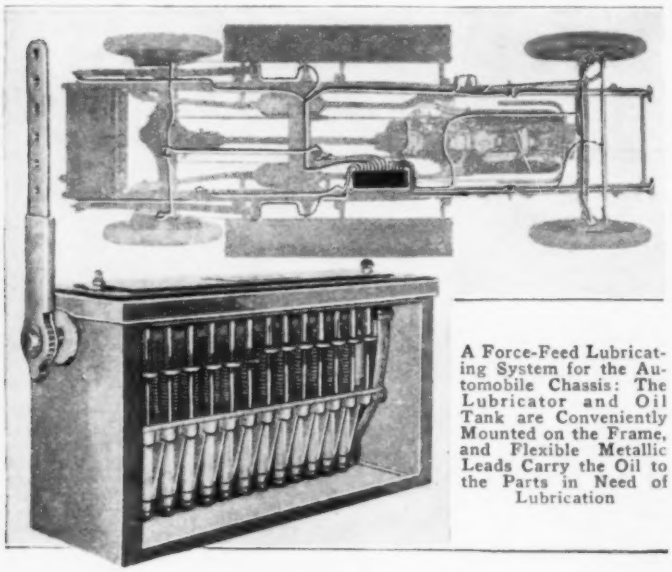
To Prevent Accidents at the Dead End of a Boulevard, the City of Los Angeles has Closed the Road with a Monumental Group to the Memory of General Harrison G. Otis. In This Rear View of the Monument, a Newsboy Crying His Wares Is the Outstanding Figure

DANGEROUS ROAD IS GUARDED BY MONUMENT

A Los Angeles boulevard comes to an end at the edge of a high embankment over a park lake; incautious motorists have gone over several times, but with fortunate results. To guard against a repetition of such accidents a monument to the memory of Gen. Harrison G. Otis, distinguished as a soldier and journalist, which will completely block the end of the road, has been erected. The group is composed of a life-sized figure of General Otis; at his left is the figure of a soldier, while at the right of the central figure is a newsboy crying his wares. The monument was designed by Prince Paul Troubetzkoy. General Otis, during his life, was owner and publisher of the Los Angeles Times, the plant of which was blown up several years ago with the loss of a number of lives.

AUTO CHASSIS LUBRICATED BY FORCE-FEED SYSTEM

Owing to the general inconvenience and unsatisfactory results that have attended chassis lubrication by the time-honored method of grease and oil cups a force-feed system has been developed which takes care of the chassis lubrication with mechanical positiveness.



A Force-Feed Lubricating System for the Automobile Chassis: The Lubricator and Oil Tank are Conveniently Mounted on the Frame, and Flexible Metallic Leads Carry the Oil to the Parts in Need of Lubrication

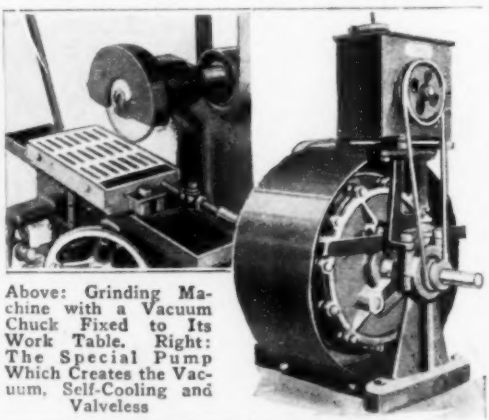
The lubricator consists of an oil reservoir containing a number of pumps, the plungers of which are operated by cams. The camshaft is rotated by a ratchet-and-pawl arrangement, operated by a lever on the outside of the reservoir. The device need be operated only once each week for a few seconds. Specially made flexible pipes conduct the oil from the individual pumps of the lubricator to the parts of the chassis and running gear to be lubricated. The entire system is manually operated and can be installed on any car.

CITY OF TERRE HAUTE ADOPTS TOWN-PLANNING SYSTEM

For taking care of the future growth and appearance of the city, Terre Haute, Ind., has adopted a planning system which will involve the construction of various civic buildings, among which is a proposed coliseum. This building will have a seating capacity of about 5,500, and it is contemplated that the basement be used as a permanent exhibition hall of the city's industrial products.

VACUUM CHUCK FOR MAGNETIC OR NONMAGNETIC METALS

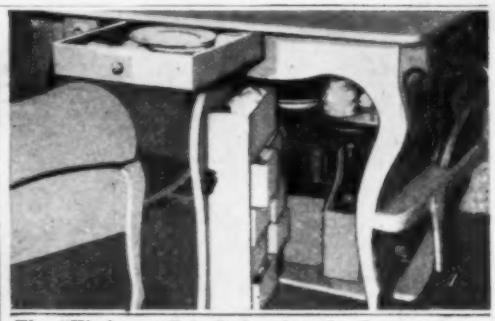
The magnetic chuck does not hold some materials that are used in manufacture. A recent application of the vacuum pump permits the control of magnetic as well as nonmagnetic metals. The new design consists essentially of a chuck with a hollow cast-iron body connected by a flexible hose to a vacuum tank, the vacuum being produced by a pump. A series of small holes are drilled through the top face of the chuck and lead to the vacuum chamber inside. The chuck is provided with lugs for bolting to the machine table and with a pipe connection for the flexible hose. A thin gasket of rubber or paper prevents any leakage between the chuck and the work, although for final grinding this may be eliminated. The main body or case of the pump contains a rotor and both revolve around a stationary shaft, automatic air cooling being provided by the revolving case. The intake of the pump is through the hollow center shaft and the outlet is through an opening to the left of the center. There are no valves.



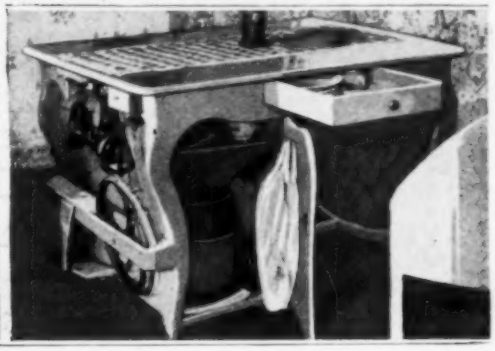
Above: Grinding Machine with a Vacuum Chuck Fixed to Its Work Table. Right: The Special Pump Which Creates the Vacuum, Self-Cooling and Valveless

¶Tourist traffic to Alaska this year is reported to have broken all previous records.

A Dining Table, Chairs, and Bed for Two Persons Are Only Part of a Recently Invented Folding "Flat" of French Origin



The "Kitchenette" is Reduced to Its Lowest Terms. The Contents of the Box Ride without Damage as a Special Place is Provided for Everything



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The Photograph at the Left Shows a Comfortable Chair and Footrest Contained in the Magic Box; the View at the Right Shows How the Box of Tricks is Converted into a Dining Table, and How the Sewing Machine and Other Accessories are Stowed

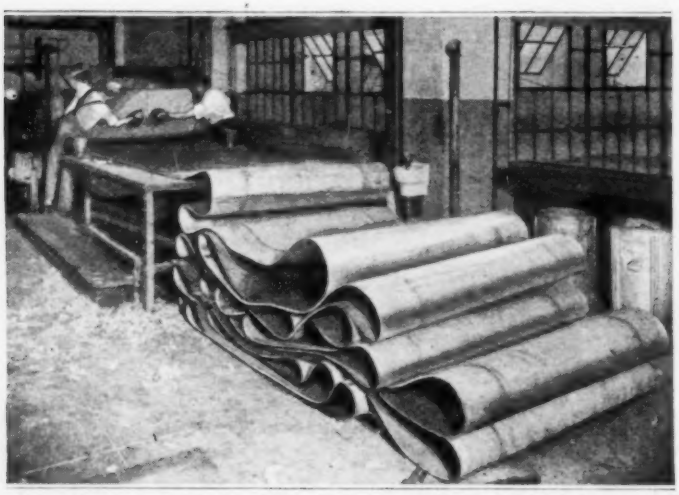
COMPLETE SET OF FURNITURE CARRIED IN SINGLE CASE

"Moving day" will lose its terrors when the householder provides himself with a set of furniture invented recently by a young Frenchman. Though the set comprises a double bed, three chairs, table, sewing machine, stove, half a dozen drawers, sideboard with dishes, and a washtub—not to mention a score of accessories—it can all be collapsed and packed away in a box measuring 54 by 49 by 33 in. This can be carried conveniently up and down stairs and through any door of ordinary width. During transportation the contents of the box ride without damage, as each article, large or small, has its special place.

ELECTRIC PUMP FURNISHES CAMPERS WITH WATER

Along the hillsides bordering the Big Thompson River in Estes Park, there is a growing colony of cabins and cottages which are occupied during the summer by campers. In order that this small, but flourishing summer resort should have a plentiful supply of water for cooking and toilet purposes, a complete water-supply system was installed. Down on the river bank is a small electrically driven pump which elevates the water from the river to a reservoir on the side of the mountain, whence it is distributed by a pipe line to the cottages below.

This Electrically Driven Pump Lifts Water from a River to a Reservoir in the Mountains, Whence It is Distributed to Cottages Occupied by Summer Campers



A 3,000-Pound Leather Belt That will Operate Continuously Day and Night at a Speed of a Mile a Minute to Transmit 1,000 Horsepower: In This Belt Only the Centers from the Tanned Hides of 670 Steers were Used

HIDES OF 670 STEERS MAKE WORLD'S LARGEST BELT

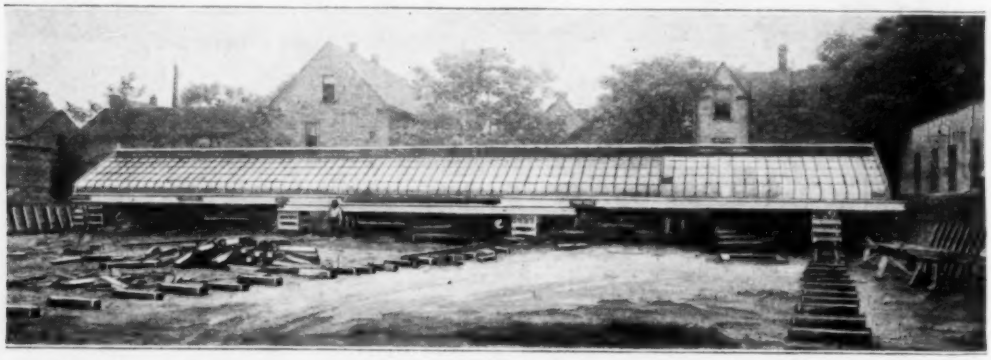
A Philadelphia manufacturer of leather transmission belting has recently completed what is said to be the largest leather belt in the world. The finished belt weighed 3,000 lb., or a ton and a half. In service it will operate, day and night, at a speed of a mile a minute, to transmit 1,000 hp. The making of this huge belt required the centers, or the strongest and toughest part of the tanned hides from 670 heavy steers.

MOVING A GREENHOUSE A DELICATE UNDERTAKING

BY moving a huge glass-inclosed greenhouse for a distance of 100 ft. and elevating it 22 ft. into the air, without the breakage of a single pane of glass, an eastern firm successfully accomplished one of the most ticklish contracts of their long experience.

The building was carefully prepared for its journey by an accurately calculated and complicated arrangement of supports and braces, for distributing the weight evenly. Longitudinal steel beams on each side supported crossbeams which bore the direct load. At the same time, special supports had to be made for the hundreds of feet of steam-heating pipes and radiators, benches, electric wiring, and water connections; some of the benches even contained growing plants. At the end of its 100-ft. journey the greenhouse was elevated 22 ft. on a timber cribbing, so that a new building could be erected underneath. When the new structure had been completed, the old greenhouse was carefully lowered so that the roof of the former made the new floor of the latter.

The curved panes of glass on the sides of the roof were valued at $5 each, in a contract by which the contractor guaranteed the removal of the conservatory without the breakage of a single pane. Five days were consumed in getting the building ready for the trip, and the actual moving and raising required another five days. A considerable saving in time and money was made by moving the greenhouse instead of tearing it down completely and rebuilding it.



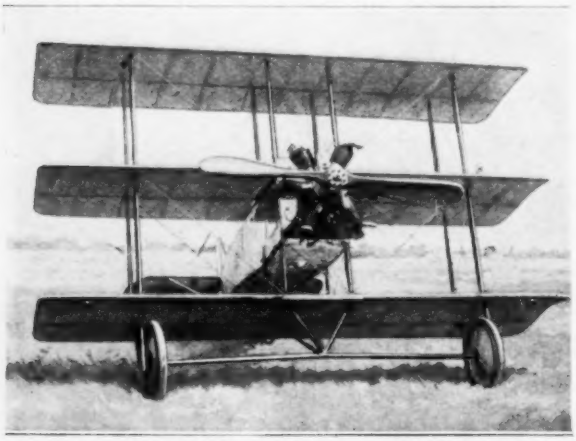
The Greenhouse, Prepared to Begin Its Voyage from the Original Location: Not a Single Pane of Glass was Broken; the Open Space on the Side Is a Hole through Which a Temporary Stovepipe was Inserted

A Lengthwise View Showing the Benches, Steam-Heating System, Wiring, and Water-Supply Lines Intact: The Interesting Method of Supporting the Building Itself and Relieving It of Strain is Clearly Shown

At the End of Its Journey, the Greenhouse was Elevated 22 Feet and Remained Supported Until a New Building had been Built Underneath; the Roof of the New Building Forms the Floor of the Conservatory

MIDGET TRIPLANE EXCELS AT ITALIAN AIR MEET

Of the half dozen or more midget airplanes now being turned out by Italian manufacturers in an attempt to popularize flying, one of the best performers, judging from the results of recent races at Milan, Italy, is the Pensuti triplane. In the course of this competition the plane took first honors for quickness of "pull-up," for quickness of take-off, and for controllability on the ground. It is a triplane with uniform span of 13 ft., and is powered with a 35-hp., six-cylinder engine. An interesting structural feature, making for safety in landing, is the placing of the two landing wheels near the tips of the bottom planes.



CENTRAL NEWS PHOTO SERVICE

This Midget, Low-Priced Triplane Took Triple Honors at an Aerial Meet Held Recently near Milan, Italy. The Span Is Only 13 Feet

COMPRESSED AIR EMPLOYED TO FRACTURE GRANITE

Replacing blasting powder with compressed air at a pressure of only 100 lb. is the unusual method employed for fracturing granite at a Georgia quarry. The granite bed is solid, lacking the usual vertical and horizontal seams, and it is necessary first to drill two 3-in. holes about 8 ft. deep, and fire small charges of black powder to start a horizontal fracture. Pipes are then inserted and made air-tight, and the air is then pumped in. The seemingly light pressure, really equal to 14,400 lb. per square foot, is so much greater than the weight of the 8-ft. stratum of granite, that the first horizontal fracture is extended in all directions over an area of one or two acres.

FUEL GAS MADE FROM STRAW INTERESTS GOVERNMENT

Any new form of fuel receives exceptional attention nowadays, and some unusual sources of power are being investigated by government scientists. Promising experiments now are being made by the Department of Agriculture on the distillation of fuel gas from common straw, a process discovered in Canada and described in Popular Mechanics Magazine in August and November, 1918. In the small plant set up on the experimental farm at Arlington, Va., the straw of wheat, oats, barley, rye, and rice is being used, as well as cornstalks and cobs. The purpose is to develop a form of producing plant suitable for installation on any farm, with which enough gas may be generated for all the farmer's power, heating, and lighting requirements, including possibly his tractors and motor cars. Valuable by-products such as tar, ammonia, carbon, and fertilizing chemicals also are produced as residues of the distillation. In the Canadian experiments, over 12,000 cu. ft. of gas, equal in power to 40 gal. of gasoline, was produced from one ton of straw.

SHOE-SHAPED BODY OF AUTO ADVERTISES OWNER'S WARES

Another addition to the large and interesting collection of "freak" automobile bodies advertises a Pacific-coast shoe business. The proprietor of the store has had a body in the form of a large shoe mounted on a light chassis. The toe is made up of a number of overlapping strips over the radiator to permit circulation of air.

This Automobile Body in the Form of a Shoe, Strikingly Advertises the Owner's Business. The Toe is Composed of Overlapping Strips over the Radiator

ACCIDENTAL LAKE OF GASOLINE RELIEVES LOCAL FAMINE

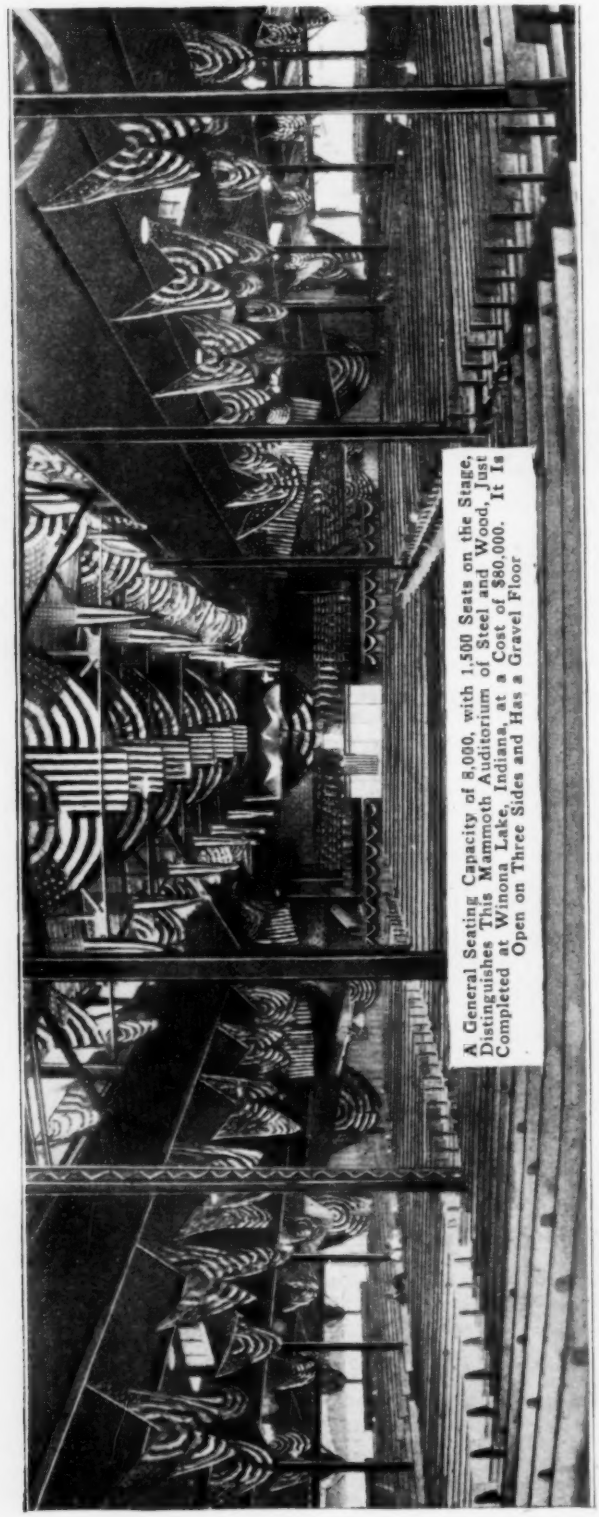
IT frequently happens that the "wind is tempered to the shorn lamb" in curious and not exactly providential ways. At the height of the current gasoline famine in the far West, with indignant motorists limited to so many gallons a day, a veritable lake of the precious fluid suddenly appeared in an Oregon field. Excited residents soon drained the new pool with pails, cans, and tanks, acquiring in the aggregate several thousand gallons without fee. The strange lake, however, was not geological, but flowed from the wreckage of a railroad train containing five loaded tank cars. The wreck, said to be caused by a broken wheel, was quite disastrous, 20 cars in all going into the ditch.

TRACTOR SNOWPLOW CLEARS WINTER HIGHWAYS

Tractor power, applied directly to a V-shaped plow, was found in the past season to be a highly satisfactory means of keeping highways open in winter. One Illinois concern builds the plow right around the tractor, using two 12-in. planks 15 ft. long, one above the other on edge, for each side. Their meeting point in front is reinforced with a nose of sheet steel, and the whole is firmly braced and bolted to the frame of the tractor. The nose is so arranged that it may be raised and lowered. With this outfit no difficulty was found in clearing away snow 12 in. deep.

Side and Rear of the Plow: The Heavy Machine Packs the Cleared Snow Solidly at the Sides

Front View of the Tractor Plow Breaking through 12 Inches of Snow: The Steel Nose and Its Raising Lever are Clearly Seen



A General Seating Capacity of 8,000, with 1,500 Seats on the Stage, Distinguishes This Mammoth Auditorium of Steel and Wood, Just Completed at Winona Lake, Indiana, at a Cost of $80,000. It Is Open on Three Sides and Has a Gravel Floor

HUGE AUDITORIUM DEDICATED AT OLD CHAUTAUQUA CAMP

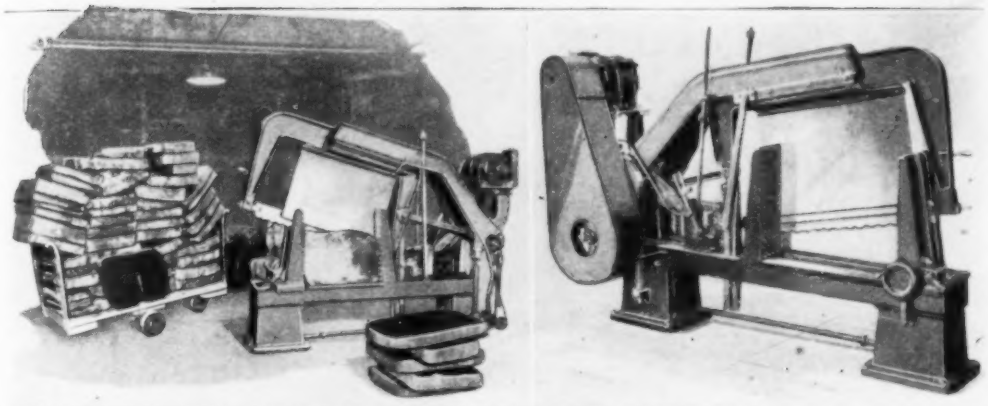
A great auditorium, one of the largest, in fact, in the United States, was dedicated by a famous evangelist a few weeks ago at Winona Lake, Ind. The cost, approximately $80,000, was defrayed by subscriptions, largely from the religious organizations which plan to hold their future assemblies and conventions at this well-known Chautauqua camp. Though open to the breezes of summer on three sides, the building is not a flimsy affair of wood, but a permanent structure of tile and steel. At one end of the gravel floor, 237 ft. wide and 367 ft. long, is the rostrum, and back of it, the stage with seats for 1,500. Over the rest of the floor are ranged the hundreds of heavy wooden benches which give the auditorium its seating capacity of 8,000 persons.

HATCHING OSTRICHES IN AN INCUBATOR

When the keeper at the zoo in Madison, Wis., found that he could not hatch ostriches successfully, he promptly took the problem to the state university poultry department. The keeper had been attempting to hatch the birds in the same incubator with other and smaller eggs, supposing that he could maintain an average temperature. This, however, was too hot for the ostriches and too cool for the other eggs, since the temperature rises two to three degrees for every inch above the incubator tray. The hatches were always weak.

At the poultry department the eggs were placed in an incubator by themselves and kept at the body temperature of the mature ostrich. When at the end of the six weeks the fertile egg hatched, the bird was as strong as if hatched in desert sand.

¶Eight hundred rare chemicals necessary in laboratory work, formerly obtainable only from Germany, are now made in the United States.



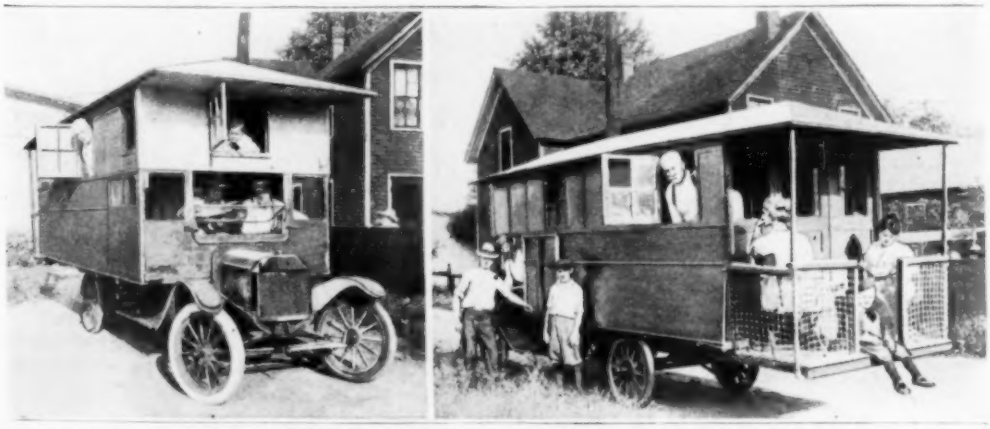
In the Left-Hand Illustration a Specially Designed Machine for Slicing Bales of Solid Rubber is Shown in Operation. The Photograph of the Machine at the Right Clearly Shows Its Resemblance to a Power Hacksaw. The Wave-Edged Blade Makes About 300 Strokes a Minute

MACHINE SLICES RUBBER BALES LIKE BREAD

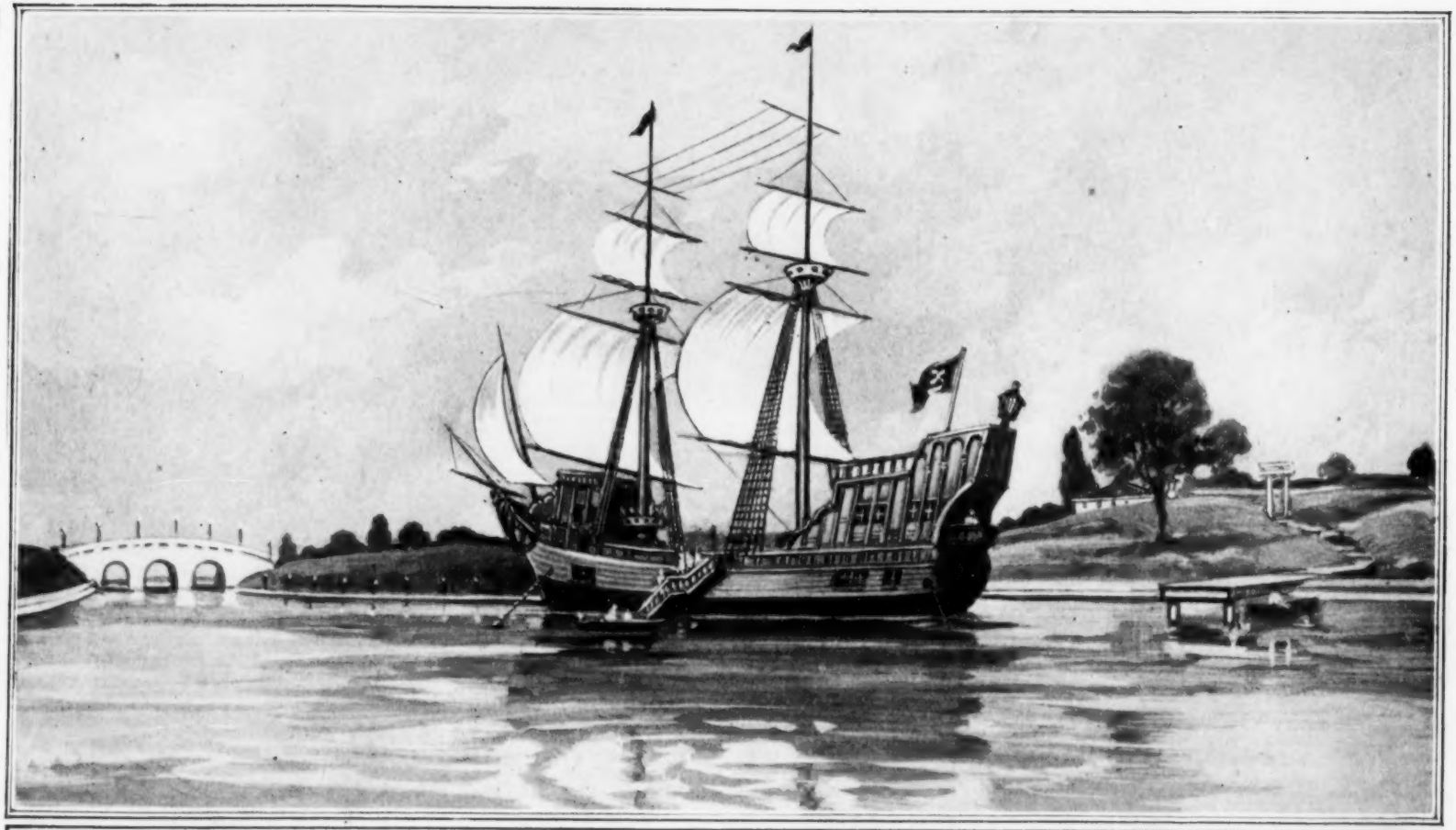
Anyone who has tried to cut through any thickness of rubber, even with the sharpest knife, knows the difficulty that would be encountered in cutting a bale of crude rubber into slices. A recently developed machine handles, in a 10-hour day, from 60,000 to 70,000 lb. of baled, smoked sheets. It operates on the principle of a power hacksaw. The bale is held between vertical clamps, and a rectangular guide is provided which acts as a wedge to hold the rubber sheets apart and decrease friction on the knife. The wavy and keen-edged knife is assisted in cutting by a thin film of water conveyed from the inside of the guide by a special circulating system. Means for automatically stopping the machine, if foreign matter, such as wood or metal, is encountered by the knife, are also provided.

FOUR-ROOM AUTO BUNGALOW IS TRAVELING HOME

Designed primarily for a family trip to California and back, an Illinois man's new auto bungalow is attracting much attention because, unlike most similar contrivances, it has four rooms. The body, mounted on a light truck chassis, is 20 ft. long and 8½ ft. wide, with a commodious porch or observation platform across the back. The structure is high enough to give space for a bedroom over the driver's compartment, and just back of it are two more bedrooms, first and second story. The combined living and dining room has a door at the side as well as at the back, an inclosed toilet and lavatory, and all other necessary conveniences. Electric lights, a heating plant connected with the engine, and hot and cold-water supply are other interesting features.



Front and Rear Views of the Four-Room Auto Bungalow: The Forward Part, as Seen at the Left, Is Two Stories High, Containing Bedrooms, While the Spacious Rear Porch Is Visible at the Right



The Good Ship "Port of Missing Men," Reproduction of a Spanish Galleon of the 15th Century, and Now a Modern Clubhouse for a Group of Yachting Enthusiasts, as It Swings at Anchor in the Drainage-Canal Harbor North of Chicago: A Great Lakes Sailing Vessel Formed the Foundation on Which the High Poop and Removable Deckhouse were Built, but the Sturdy Craft No Longer Propels Itself. When the Club Members Wish to Attend a Yacht Race, They Hitch Their Clubhouse to a Tug

"CLUBHOUSE" CARRIES AMATEUR YACHTSMEN TO RACES

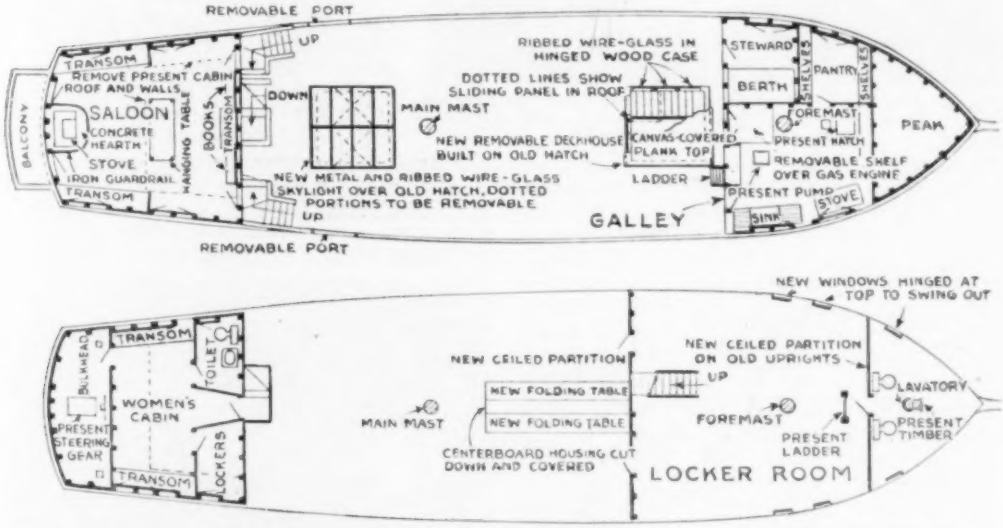
In the snug harbor formed by the "headquarters" of Chicago's famous drainage canal, at Wilmette, Ill., there now rides a colorful replica of the galleons that bore the buccaneers of old up and down the Spanish Main. The vessel is a clubhouse, and is named the "Port of Missing Men." The members of the club are well-to-do business men of Chicago and vicinity who have been drawn together by a common fondness for, and skill in handling, small racing yachts. Ordinarily the "Port of Missing Men" is anchored in the little harbor. On days when races are scheduled, however, a tug is hired, and the staid "buccaneers" are towed in the clubhouse to the scene of the meet.

Prior to the picturesque transformation, the vessel was a stanch sailing craft, 125 ft. long, of the type which the high cost of crews and the competition of steam is forcing from the lakes. In the yard of the refitters, cabin space was increased by the addition of a high poop at the stern, and a large galley was installed. Below deck there was arranged a commodious lounge, lighted by antique lanterns, and furnished appropriately with benches and a table of the heaviest oak. Aft, on the main deck, was built a saloon, with open fireplace and doors opening upon the balcony at the stern.

ELECTRICAL HEAT CONTROLLED BY SMALL REGULATOR

For controlling the temperature and automatically shutting off the current from electrically heated steam radiators, heating tables, and similar devices, a small regulating device has been developed. The controlling instrument is said to operate at any temperature above 3° F. and on any steam or air pressure. When the desired temperature has been reached the device automatically shuts off the current or turns it on when the temperature falls below a predetermined limit, thus economizing current.

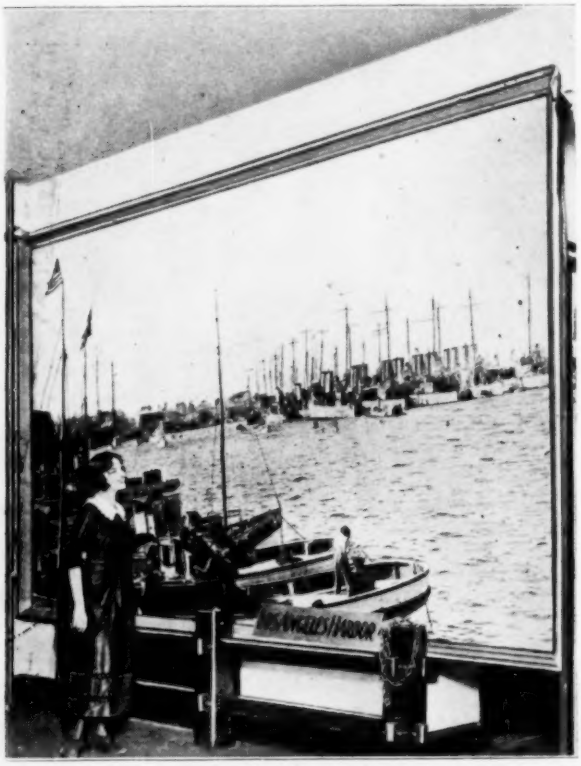
The Upper Illustration Shows a Compact Little Instrument for Attachment to Electrically Heated Devices for Turning the Current On and Off Automatically. At the Left the Regulator is Attached to an Electrically Heated Steam Radiator



Upper and Lower Deck Plans, Respectively, of the Clubhouse Ship "Port of Missing Men": The Lettering Tells, Better than Description, the Alterations That were Made, and the Vessel's Present Arrangement. The Commodious Lounge is Furnished in Heavy Oak and Lighted by Antique Lanterns

PHOTOS OF ENORMOUS SIZE FOR MOVIE BACKGROUNDS

Photographic prints of extremely large size are being made from ordinary small



Photographic Print of Los Angeles Harbor, Measuring Nine by Fourteen Feet, Enlarged by Special Process from a Four by Five-Inch Negative

negatives by a process invented by a California photographer, which retains in the magnification all the original clearness of detail. One such print, made from a 4 by 5-in. negative of a fleet of U. S. destroyers in Los Angeles harbor, measures 9 by 14 ft. Motion-picture producers find these immense "stills" highly valuable as backgrounds for the window openings of interior views. This purpose they serve more faithfully than paintings, being accurate to life, and their use makes it unnecessary to transport the whole setting to a location offering a real background.

¶Three hundred tons of coal from a sunken boat on the bottom of Long Island Sound were recently landed at Bridgeport, Conn. The coal was brought up from the depths of the sound by the apparatus for the salving of sunken cargoes described in the October, 1919, number of Popular Mechanics.

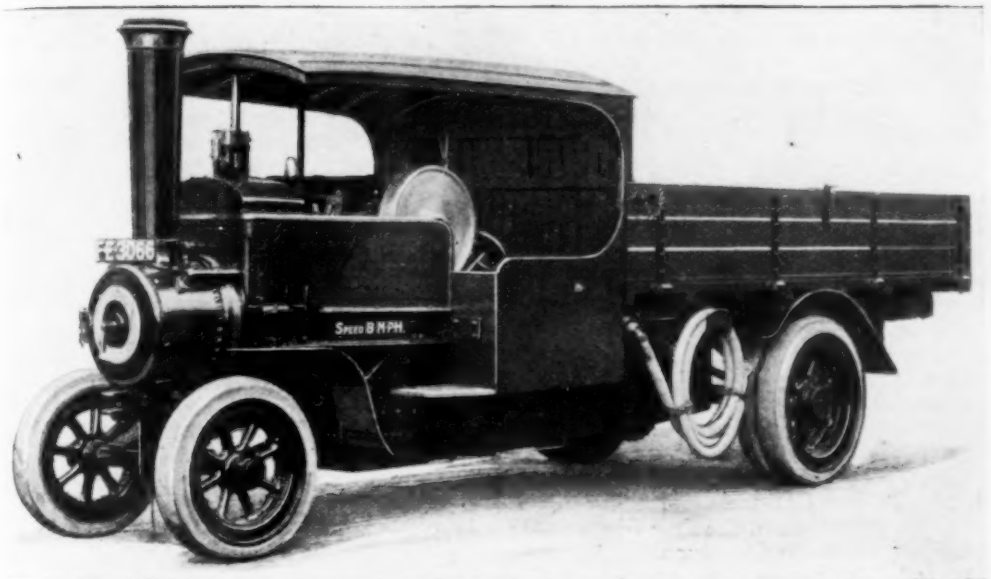
NEW COMMISSION TO DEVELOP NATIONAL WATER POWERS

With a newly created Federal Power Commission ready to push the development of water powers that are potentially more than sufficient for all its industries, the United States may now look confidently forward to eventual relief from famines and high prices of coal and oil. The new commission, composed of the secretaries of war, agriculture, and the interior, besides conducting its own investigations and coöperating with other bodies of similar purpose, will issue licenses for the construction of dams, transmission lines, and other items of plant; give preliminary permits for water-power study, and prescribe rules for the conduct of licensees. A license runs not to exceed 50 years, and provides for beginning construction within a specified time.

It is estimated that the total theoretical horsepower of all streams in the United States reaches the stupendous figure of 320,000,000, of which 54,000,000 hp. are actually available for development, while less than 5,000,000 hp. are now developed. The industrial plants of the country have a total capacity of but 30,000,000 hp., of which only about 6,000,000 hp. are used continuously. More than 70 per cent of the available new power lies west of the Mississippi River, while more than 70 per cent of all now used is east of that line.

POWERFUL SLOW-SPEED TRUCK IS DRIVEN BY STEAM

Steam, generated in a locomotive-type boiler, is the motive power of a new form of five-ton highway truck designed in England. A steam pressure of 200 lb. is used, and the two cylinders, one 4-in. and the other 6¾-in. bore, by 7-in. stroke, are normally run compound, but may be combined on high pressure for extra-heavy work. A shift lever gives two speeds, three and six miles an hour. The drive is a combination of gear and chain, and the differential on the rear axle may be locked while traveling on soft ground. Solid-rubber tires, 41½-in. twin-type on the rear, and 33½-in. single in front, are used. An open body, 12 by 6½ ft., is



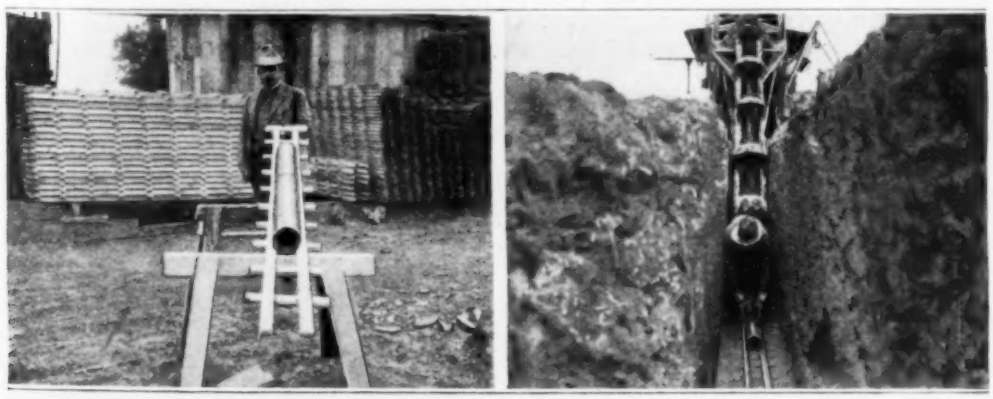
An English Five-Ton Steam Truck of Locomotive Type, Fitted with Solid-Rubber Tires and a 12 by 6½-Foot Open Body: The Two Cylinders may be Operated Either Compound or Both on High Pressure

fitted, but the driving cab is covered, its top extending forward over the engine and boiler. Enough water for 20 miles and sufficient fuel for 40 miles are carried.

WOODEN RACKS KEEP DRAINAGE TILES IN ALINEMENT

The business of laying drainage tile in swampy land is often an uncertain one, as eventually the tiles tend to "float," and so lose their alinement. The trench must sometimes be opened, as a result, and the tiles reset, joint to joint. In the work of reclaiming for horticultural purposes some 12,000 acres of waste land near Salt Lake City, however, this difficulty has been done away with by the use of a simple contrivance invented by the engineer in charge. This is a rack, or cradle, 10 ft. long, which consists of two longitudinal strips joined by 10 crosspieces. These racks are laid end to end on the bottom of the trench, like the familiar duckboards of war time, as the trenching machine progresses. The tiles are then laid between the strips. In this position they are firmly locked by the refilling of the trench.

¶Wall plasters of any desired color or degree of texture are made possible by the use of dyed wood fiber in gypsum plaster, according to a recent report by the Bureau of Standards.



Left: A Section of the Wooden Rack on Which the Drainage Tiles are Laid to Prevent Warping Out of Alinement. Right: Laying the Racks in the Trench Bottom, behind the Trenching Machine

MONSTER WIRE-WOUND GUN HEAVIEST YET MADE

BY F. K. KYLE

Completion of a new wire-wound 16-in. gun, now being mounted on a disappearing carriage at Watertown (Mass.) arsenal, is a real event in heavy-ordnance production, for this monster rifle is the heaviest gun ever manufactured.

This statement is made with care. There have been other 16-in. rifles made for the navy, but the naval type is shorter and considerably lighter. Rifles of 18-in. caliber have also been manufactured, but they were of a different pattern, and none contains so much steel as is found in the subject of this article. Other guns have been wire-wound, but they were of smaller caliber. Even the "Big Bertha" of German fame, though of considerably greater length, was only an 8-in. model, and did not approach this great rifle in weight.

Work on this gun, the first of an order of eight of a similar type to be constructed at Watervliet arsenal, N.Y., was begun the latter part of 1916, but it was delayed during the World War because of the greater demand for artillery of a smaller type, mobile artillery, or field-pieces. Ordinarily, and under most favorable circumstances, it would take two years to construct this big gun, exclusive of the mount. It will be the last to be mounted on the disappearing carriage, for the advent of the airplane and drop-bombing devices makes that style of mount obsolete.

The rifle, which has been the "pride of the shop" during its making, and the chief attraction for all visitors at the arsenal during the past year, is expected to have, with the present style of ammunition, a range of approximately 31 miles. This is about 11 miles greater than that of the first 16-in. gun in the world, which was also built at Watervliet and completed in 1902. The projectile to be hurled by this new monster weapon will weigh 2,400 lb., and a charge of 850 lb. of powder will be required for each round, giving a muzzle velocity of 2,700 ft. per second.

The wire that is bound about the tube and various hoops of the rifle is not round, but ⅛ in. square, and is wound so tightly, and in so many layers, that the gun is able to withstand a pressure of 50,000 lb. per square inch. The wire on the completed gun measures approximately 280 miles in length and weighs about 40 tons, almost one-fourth of the gun's total weight—170 tons.

The total length of the rifle is 68 ft. 10 in., the outside diameter at the breech is 64 in., and the inside diameter beyond the powder chamber is, of course, 16 in. This interior space permits the passage of an ordinary man through the tube.

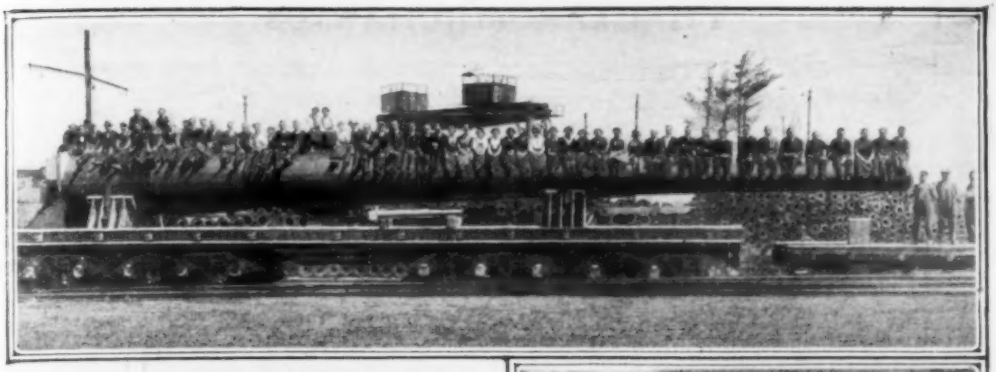
The breech mechanism of the gun is interesting, and weighs about 2,600 lb. It is the army type, similar to that used in the 14-in. guns, model of 1910. It is operated by hand with a crank and requires from 10 to 15 seconds to open or close. The breech mechanisms of the seven sister guns, on the same order and in process of manufacture, will be different, in that they will be operated by compressed air, making it possible to open or close them in about two seconds.

After noting the size of this monster gun, and that its approximate cost is $226,000, it almost takes one's breath away to learn that the "life" of the rifle is measured in seconds, and only three or four at that. For instance, not more than 150 rounds can be fired from this gun under the most auspicious circumstances, and, counting the life of the gun as the time consumed while the projectiles are actually passing through the rifled barrel, one must realize that perhaps less than three seconds will be the answer. This computation has been made by many arsenal engineers, with some diversity in results, but the greatest shaded four seconds and the smallest was perilously close to two seconds.

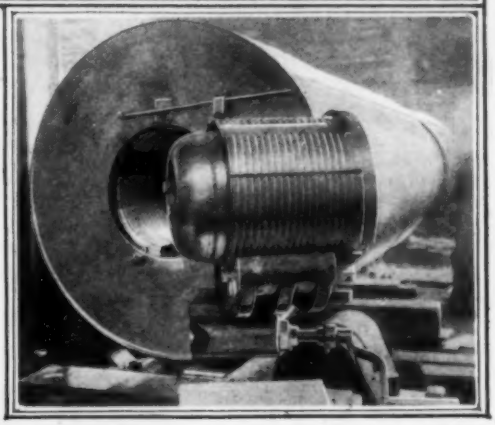
On account of its great weight the gun requires a special flat car for its transportation, and then it protrudes over the end by about 20 feet. The car on which it rides has 12 wheels on each side, and every bridge along proposed routes has to be inspected to be sure that it will sustain the great weight of the seacoast monster.

After its assembly, the first trip of the rifle was from Watervliet arsenal to Watertown, Mass., a distance of about 200 miles, in which it passed through the Hoosac Tunnel. From Watertown the gun will be taken probably to the Aberdeen proving ground for tests. After that, if it survives the tests, it will take its place among our coast defenders.

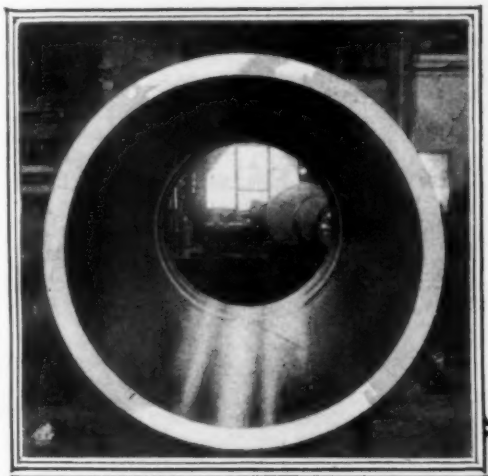
¶For the first time since the Spanish-American War, in 1898, a Spanish naval vessel is visiting in American waters. The cruiser "Alphonso XIII" left Madrid June 9, calling at Annapolis and New York as well as at Cuban, Mexican, and South American ports, in the interest of improved relations between the countries.



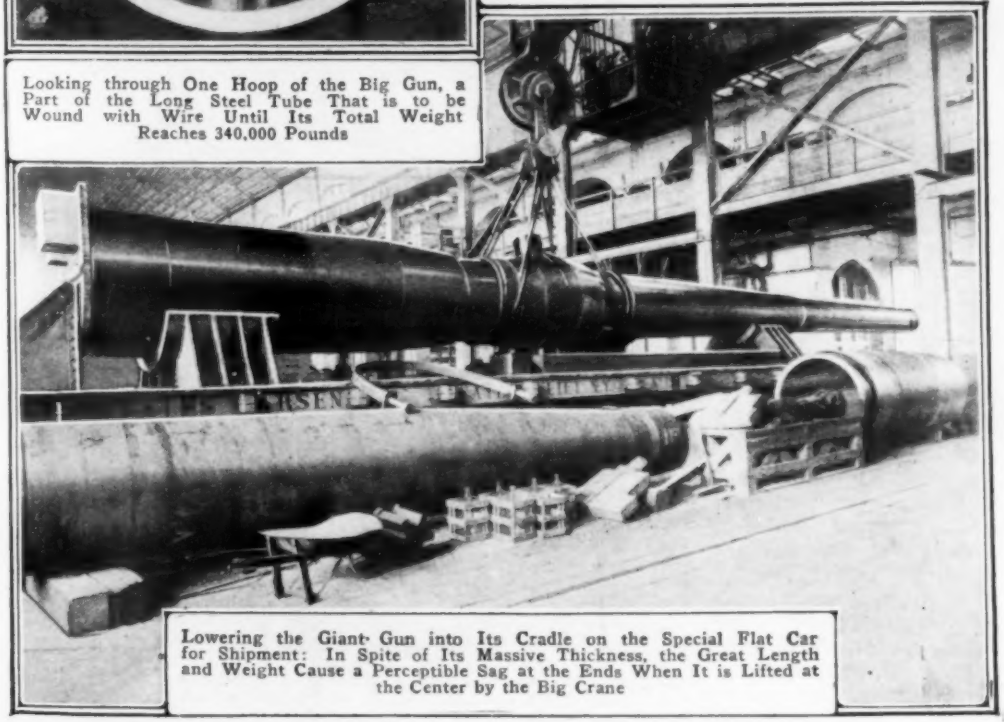
The Monster 16-Inch Rifle on Its Special Car in the Yards at Watervliet Arsenal, with 57 Persons Seated upon Its Great Barrel, and a 1¼-Inch Gun Barely Discernible beneath It



The Breech of the 16-Inch Wire-Wound Rifle, with the Breech Block Open: It is Operated with a Crank, Requiring 10 to 15 Seconds. The Total Diameter of the Barrel at the Breech Is 64 Inches



Looking through One Hoop of the Big Gun, a Part of the Long Steel Tube That is to be Wound with Wire Until Its Total Weight Reaches 340,000 Pounds



Lowering the Giant Gun into Its Cradle on the Special Flat Car for Shipment: In Spite of Its Massive Thickness, the Great Length and Weight Cause a Perceptible Sag at the Ends When It is Lifted at the Center by the Big Crane

TRACTOR, GANG PLOW, AND BINDER USED IN TANDEM

IN a little sod house near Oakley, Kan., lives a farmer whose methods and machines are as ultramodern as his habitation is primitive. One of his possessions is a threshing machine. Three others are a tractor, a gang plow, and a binder, which he uses in tandem, on occasion, in the manner depicted here. As the binder harvests the wheat, the gang plow tills the parallel swath of stubble, and so makes ready the seed bed for the crop of next year. The shocks are set upon the plowed ground.

MACHINES INVENTED TO OPEN AND BALE OILCANS

Slow manual methods having proved ineffectual in the face of the recent growth of the business, the work of opening and baling the thousands upon thousands of oilcans received in San Francisco from the Orient is now being done, in part at least, by two new machines. The first gets the cans as they come from the ship's hold, cuts the top and bottom of each along three sides, and then bends the flaps back into the can. This operation it can perform 36,000 times in a working day. Running from the opened can almost instantaneously, the oil drops into a concrete sump; thence it is pumped into storage tanks. The second machine receives the cans so emptied, and by means of a reciprocating plunger crushes them and packs them into bales of 40 each. Power for this mech-

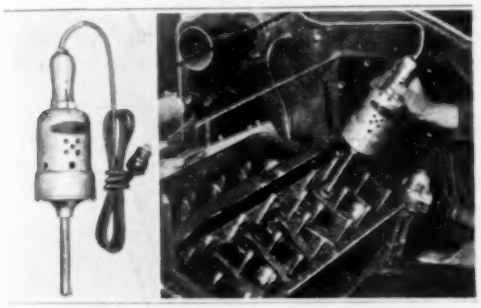
The Conveyor Carries the Cans of Oil into the Cutting Machine, Where Knives Cut Both Ends Out, Draining the Oil into a Concrete Sump

The Empty Cans are Crushed into Bales by a Reciprocating Plunger, Driven by a Worm Wheel That Takes Its Power from the Auto

anism is supplied by a belt from a pulley on the rear wheels of an automobile which runs it so rapidly that the operator is kept busy inserting cans.

MOTOR GRINDER GIVES VALVE HEAD COMPOUND MOTION

The garageman who recognizes the eventual economy of machine methods will acknowledge the value of a newly introduced electric valve grinder. Consisting of a little electric motor housed in aluminum, and a projecting shaft which engages with the slot in the valve head, the mechanism is not unlike a motor-driven screwdriver. It is different, however, in that the shaft is given a compound motion. Although it slowly revolves, in other words, it imparts to the valve head at the same time a back and forth motion through about one-quarter of a revolution. This action is controlled by means of a trigger switch at the base



Left: An Electric Valve Grinder That Turns the Valve in Its Seat, as by Hand. Right: The Grinder in Use

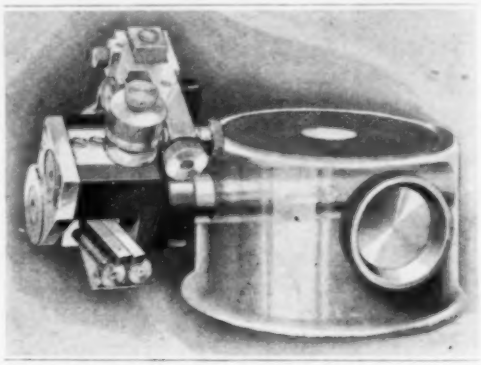
of the handle. The machine weighs only six pounds and can be connected to any 110-volt socket.

VANILLA OBTAINED FROM WILD PIMENTO LEAVES

According to experiments recently performed in London, the island of Jamaica may become a new source of supply for vanilla flavoring extract. It has been found that the leaves of the wild pimento tree which grows on the island yield a high percentage of eugenol, from which vanillin, or crude vanilla, may be obtained. The discovery is valuable economically as well as commercially, inasmuch as iso-eugenol, the halfway product between eugenol and vanillin, may be made by merely fermenting the pimento leaves, where previously an expensive chemical process has been used.

LATHE ATTACHMENT TURNS TAPERS AUTOMATICALLY

Particularly designed for cutting and turning tapers with a minimum of waste in both time and material, an automatic



A Taper-Turning Attachment Which can be Applied to Any Hand or Automatic Screw Machine, or Screw-Cutting Lathe, for Production of Such Work as Taper Pins, Reamer Blanks, and the Like, in Quantities

attachment with micrometer adjustment is a newcomer in the machine-tool field. The device is adapted for attachment to any hand or automatic screw machine, or lathe, and is specially desirable for mass production of taper pins, tailstock centers, taper reamer blanks, taper drill shanks, and articles of similar nature.

TURKEYS CONTROL PLAGUE OF GRASSHOPPERS

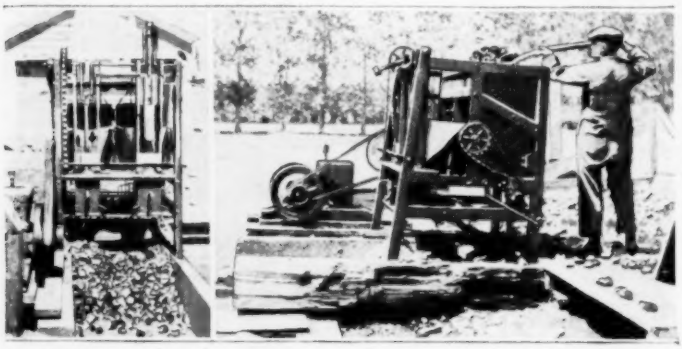
Farmers in certain sections of Texas which have suffered the ravages of clouds of hungry grasshoppers, believe they have discovered in turkeys a means of controlling the plague. These fowl thrive admirably in the state, large numbers of them being raised for the market, and

Turkeys Turned into a Grasshopper-Infested Field Provide an Effective Method of Control for a Costly Texas Pest

by turning the birds loose in an infested field not only are the crops protected but the fowls fatten themselves at no expense.

MACHINE FOR CUTTING UP SEED POTATOES

A large quantity of seed potatoes are cut up in the shortest possible time by a new machine for the purpose. The potatoes are shoveled into a hopper, from which they are conveyed endwise and one at a time underneath a mechanically operated plunger which cuts the potato into four pieces; if the potatoes are exceptionally large, the machine can be adjusted to cut them into eight pieces. A small gasoline engine operates the apparatus.



A Machine for Cutting Up Seed Potatoes: They are Fed into a Hopper, and Pass underneath Knives Which Cut Them into Four or Eight Pieces, Depending on Size

CHURCH USES SIGNBOARDS TO "SELL" SCRIPTURES

In order to get the message of the Scriptures "across" and supplement its religious activities, a Missouri church has enlisted the aid of signboards, or "outdoor advertising," as advertising men prefer to call it. The signs are located at prominent places and each has painted on it some allegorical illustration of a scriptural lesson.

Missouri Church Uses Conspicuously Located Signboards for Supplementing Its Religious Activities. Each Sign Bears a Striking Allegorical Illustration with Its Accompanying Lesson from the Scriptures

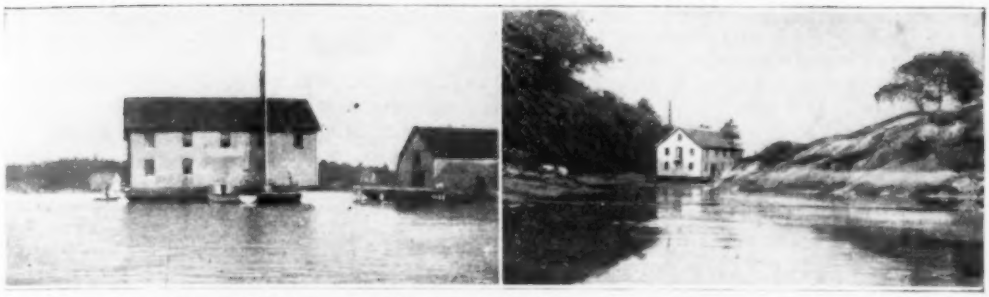
TO GIVE BANK OF ENGLAND NEW MODERN BUILDING

The Bank of England, whose ultraconservative policies have formed the basis of many amusing but wholly respectful anecdotes, is about to emerge from its ancient and dignified shell and become modernized. Plans are under way for a new and up-to-date bank building to house the multitudinous activities of the great financial center, and its patrons are indulging in some speculation as to possible changes in other visible items. Among the present details that appeal oddly to the western eye are the messengers in their long-tailed salmon coats, scarlet vests, and high hats, the porter in gold-trimmed crimson, and the 36 soldiers of the British army who form the night guard.

THE INDIAN "CANDY" TREE BEARS FAIRY FRUIT

We have all read the story of the "gingerbread house" in the fairy tales. Well, there is a family of trees in India that have "candy" flowers, or the next thing to it. These trees are known as the "Bassia" trees, and of the three important kinds, two have sugary flowers and the third is called the "Indian butter tree." The petals of the flowers are rich in sugar and drop from the tree in the early morning. They are picked up by the women and children and are spread out on mats to dry in the sun. A single tree will furnish 300 lb. of flowers in a year. When fresh, the flowers are very sweet and taste much like figs. They are eaten fresh or cooked with rice, shredded cocoanut, or flour. The seeds of the butter tree are full of oil, and this oil is used to make a kind of butter, and also for soap and candles.

¶Plans for a dirigible airship that will be the largest in the world with the exception of the "R-38," now building in England for the navy, are in the hands of the Navy Department. The new aerial monster, which will be of the Zeppelin type, will cost upward of $1,750,000 and will be 560 ft. long.



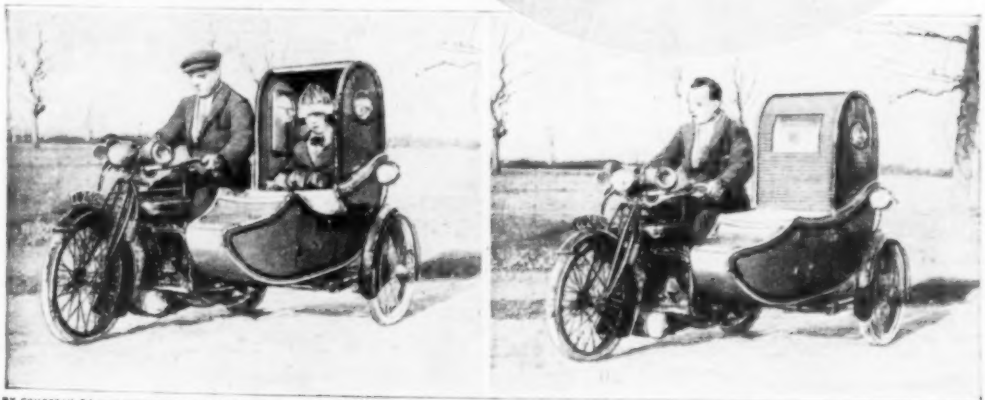
Taking a 60-Year-Old Building for a Sea Voyage of 12 Miles to a New Location Where It will be Used as a Tannery for Making Leather from Fish Skins: The Structure was Originally Used as a Sail Loft

SIDECAR SCREEN GIVES REAL COMFORT TO PASSENGER

A sidecar and folding screen which protects the passenger from rain, cold, and wind, has made its appearance on the highways of England. The hood is made of sheet metal and folds completely out of view between the double sidewalls of the sidecar. Operating on the principle of the top of a roll-top desk, the wind screen can be raised or lowered at the will of the occupant, who can see what is going on outside through a celluloid window in front. A locking device holds the hood securely in place when in raised position. A waterproof apron prevents the entrance of rain, cold, or wind through the gap at the bottom of the screen. When the accessory is no longer needed it is entirely concealed within the body of the sidecar. The only disadvantage of this new type of sidecar is the head resistance when the screen is in the raised position; otherwise the operating efficiency of the motorcycle is unimpaired.

BUILDING TAKES A TWELVE-MILE OCEAN VOYAGE

One of the most interesting house-moving contracts was successfully consummated near Boothbay Harbor, Me., by the removal of a large building to a new location, which required an ocean voyage of 12 miles. The building, an old sail loft, 60 by 30 ft., and two and a half stories high, was built 60 years ago and weighs over 70 tons. After the prelimi-



BY COURTESY OF THE MOTOR CYCLE, LONDON

In the Upper View the Screen is Entirely Concealed within the Body of the Sidecar; the Left-Hand View Shows the Sheet-Metal Hood as It Appears When Raised. By Merely Pulling Down the Flexible Wind Screen and Making Fast the Apron, as in the Illustration at the Right, the Passenger is Completely Protected

nary work had been completed the actual voyage to the new site was made in five hours. A fisheries corporation, the owners of the building, will utilize it as a tannery for the manufacture of fish-skin leather.

METAL "THIMBLES" AN AID TO COTTON PICKERS

A simple, thimblelike device of metal worn on the fingers of a cotton picker is claimed to increase the capacity of the worker greatly. The inside surface of the recently marketed "picker" has five small cleats stamped into it to give tenacity of grip. In addition to the large increase in production claimed for it, the device also prevents pricking of the fingers on cotton burs. The stampings can be carried in a pocket.

BULLETIN BOARD FACILITATES REUNIONS OF "OUTLANDERS"

A Pacific-coast town, where the number of ex-residents of other states constitutes a menace to the "native son," has erected registration bulletins on the grounds where annual reunions of the "outlanders" are held. Blanks are provided for the name, and the local and "back-home" addresses. Thus a visitor can learn which of his friends are on the grounds and look them up, and each bulletin is the scene of many joyful reunions between friends from the old-home town.

ENORMOUS NEW CATTLE BARN HOUSES A THOUSAND HEAD

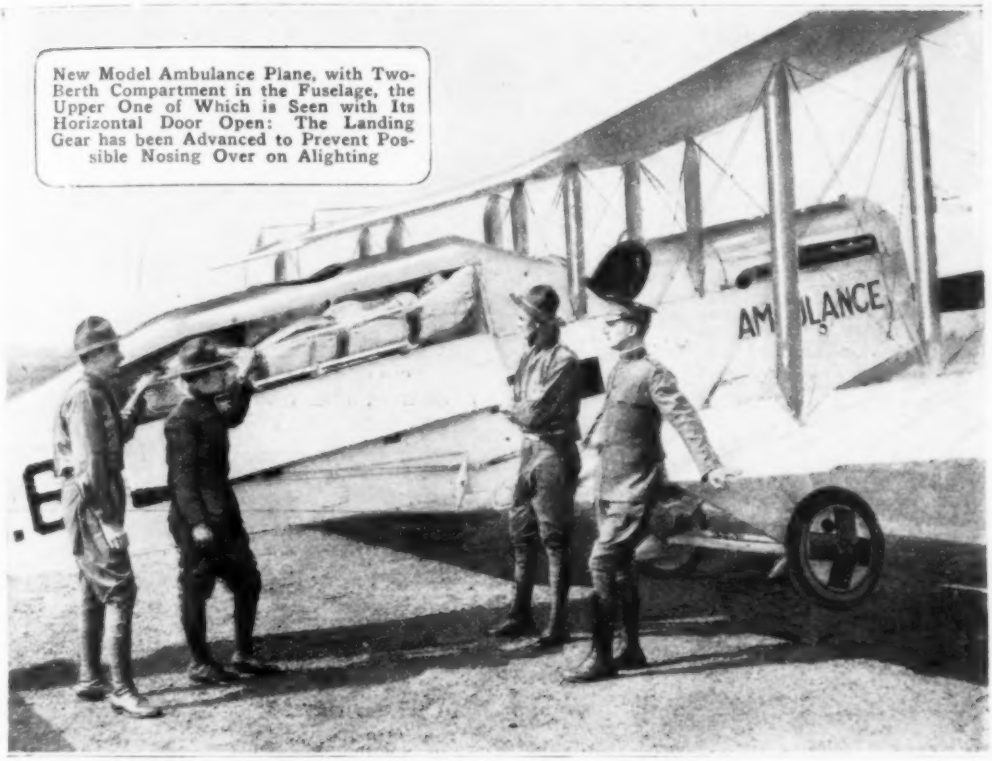
Accommodation in steel stalls for 1,000 head of cattle, with running water and individual buckets at each tier of stalls, is provided in a $500,000 barn, declared to be the largest in the world, recently completed at the Minnesota state fair. Brick and reinforced concrete are the structural materials of the mammoth one-story building, 400 ft. long and 235 ft. wide, which has a basement, and mezzanine floors at the ends for herdsmen's quarters. Huge sewage conduits and special ventilating arrangements are features of the big structure, which takes the place of eight other barns that had become inadequate.

IMPROVED HOLDER FOR REELS OF ADMISSION TICKETS

For holding the reels of tickets with which most patrons of the movies are familiar, an improved fixture has been brought forth. A separate axle, which is rigidly fastened at one end, is provided for each reel of tickets. A metal arm and catch, which is dropped over the opposite end, holds the reel in place. The axles are ball-bearing, and one reel can be removed or inserted independently of the other.

HAND-OPERATED FLASHLIGHT REQUIRES NO BATTERY

A French inventor has succeeded in perfecting a flashlight that, instead of the usual battery, has a small electric generator concealed inside the metal case. The tiny dynamo is driven by pressing on a lever which operates multiplying gears attached to the armature at a sufficient rate of speed to produce a strong illumination whenever the handle is pressed. The lamp can be taken apart easily for inspection or repair.



New Model Ambulance Plane, with Two-Berth Compartment in the Fuselage, the Upper One of Which is Seen with Its Horizontal Door Open: The Landing Gear has been Advanced to Prevent Possible Nosing Over on Alighting

NEW AERIAL AMBULANCE HAS SPECIAL FUSELAGE

Accommodation for two stretcher patients in the upper and lower compartments of the special fuselage is the interesting structural feature of a new model ambulance airplane recently tried out at Dayton, Ohio. Horizontal full-length doors give access to the stretcher berths, which are ventilated and lighted by windows. A cockpit with a portable seat above the compartment permits the medical officer to travel with his patients, making a total capacity of four passengers for the DH-4-type plane. To prevent possible nosing over on landing, the forward landing wheels have been advanced 7 ft., and slight changes have been made in the wing angles and relations.

NEW BUMPER LOCK PREVENTS REMOVAL OF AUTOMOBILE

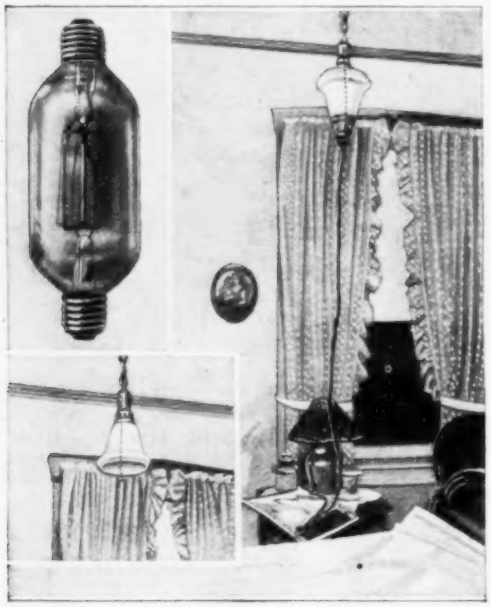
A challenge to automobile thieves to exercise some more of their perverted ingenuity in making away with other peoples' cars is contained in a locking device that is concealed in the bumper. The bumper conforms closely to the conventional type, but inside the tubular section

Left: The New Automobile Lock Slides In and Out of a Tubular Fender, of Which It Is a Part. Center: The Curved Ends Hang Downward When the Car Is in Use. Right: The Ends are Turned to Bear against the Tires and Locked, Making It Impossible to Tow or Steer the Car

are sliding rods on which are formed the curved ends of the bumper. A lock secures either of the sliding ends in any desired position and controls both ends. When the car is in use the curved ends are turned down, but when it is left standing the ends are brought up to bear against the front tires and locked, making it impossible to steer the car or even tow it away.

DOUBLE-BASE LAMP PERMITS ATTACHMENT OF FIXTURES

An electric-lamp globe that has a double base is the latest electrical accessory to



An Electric-Lamp Globe with Two Bases That Permit the Attachment to It of Household Electrical Devices without Interfering with the Illumination

demand the interest of consumers whose homes lack floor attachments. With the new lamp installed in a ceiling fixture, an electric fan, sewing-machine motor, or other electric device, can be connected to the lower base. Heavy lead wires, that conform to 500-watt, 115-volt specifications, run through the lamp from base to base and the filament is tapped off from them.

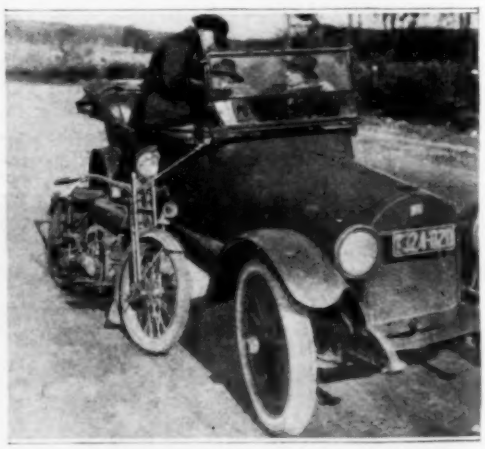
¶Landing on a long, flat ice field, recently discovered on top of Mt. Rainier, Wash., 14,000 ft. high, is a feat soon to be attempted by western airmen. Lack of buoyancy and oxygen in the rarefied air is expected to make both landing and leaving difficult.

ALASKA'S BLACK MAGNETIC SANDS ARE RICH IN GOLD

Tests which have been made at the Alaska station of the Bureau of Mines on samples of magnetic sand prove them to be quite rich in gold and worth treating. Over 90 per cent of a 112-lb. sample examined was magnetite and garnet, both of which can be separated magnetically. Six different tests, by as many processes, were made, and it was ascertained that the best recovery was obtained by amalgamation in a barrel, without cyanide, and using a small amount of caustic soda. The latter chemical was used as an aid in amalgamation, and cyanide was excluded, as it was ascertained that the addition thereof, either before or during amalgamation, resulted in the loss of from 5 to 10 per cent of the metal through its solvent action. From the sample treated by this process, which weighed 14 lb., $2.27 worth of gold, 97 per cent of the total amount contained, was recovered.

AUTOS TAGGED BY MOTOR "COP" WITHOUT STOPPING

A western speed "cop" who is mounted on a motorcycle has evolved the latest trick of his tribe. He has a length of heavy cable, with a stout hook at one end, attached to his machine. Running alongside an offender he fastens the hook to the windshield of the car, the motorcycle being held upright by resting the handlebars against the body. In this manner the officer can hand the offender a summons without either stopping his engine.



The Newest Trick of the Speed "Cop" Consists in Hooking His Motorcycle to the Offender's Machine While He Writes Out a Summons. In This Manner It Is Unnecessary for Either to Stop His Engine

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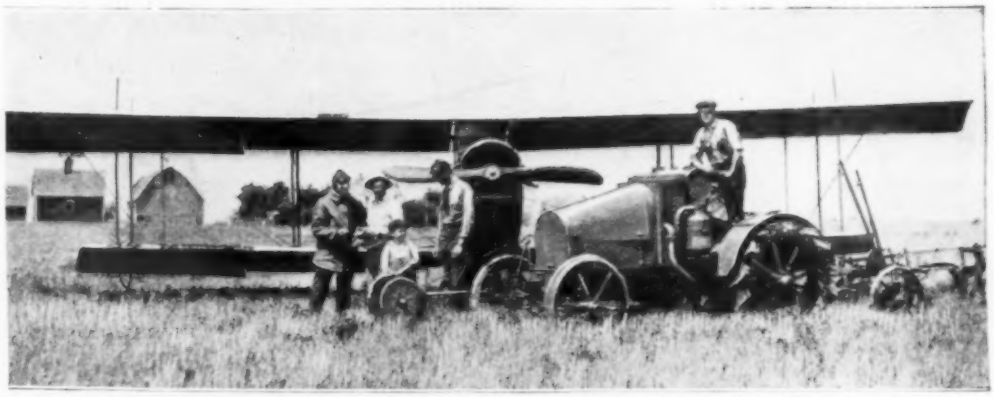
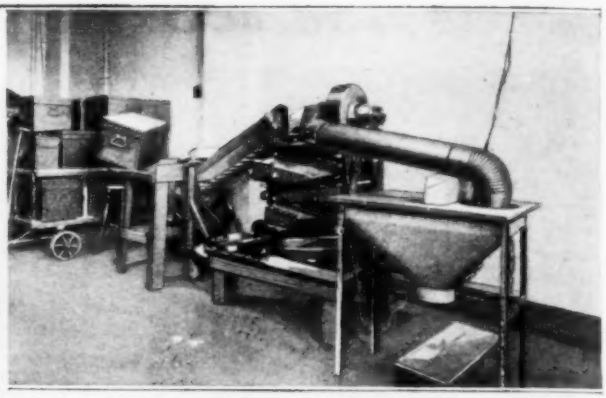
GIGANTIC EXPLOSION DESTROYS LIVES AND PROPERTY IN NEW YORK

JUST at noon on Thursday, September 16, an explosion of tremendous violence occurred at the crowded corner of Wall and Broad streets, New York City, killing 29 persons outright, injuring hundreds of others, and causing property damage estimated at $2,000,000. The fact that metal fragments were afterward found scattered about the scene convinced the authorities that the blast was caused by a bomb, and was intentional. Its location was in the heart of the city's financial district, at the very door of the government's new assay office, next to the subtreasury, and directly across the street from the imposing office building of a banking concern of international fame. The appearance of the street immediately after the explosion was indescribable, and the picture gives but a faint idea of the confusion. The bodies of the victims lay everywhere, and over all was a veritable carpet of splintered plate glass, from thousands of windows. It is calculated that $600,000 will not cover the value of the glass alone, destroyed by the shock.



AIRMAN BORROWS GASOLINE FROM TRACTOR DRIVER

AN interesting picture taken in an Illinois farmer's field suggests an expedient in an emergency for supplies and gasoline, particularly along air routes of considerable extent in an agricultural country. The plane, after a successful landing, is being furnished with a supply of gasoline from the tractor, previous to the continuance of its flight.



Left: The Strong Boxes as Received at the Counting Room. Above: The Ticket Separator, or Jogging Machine, Which Receives the Coins, Tokens, and Tickets from the Boxes by Means of a Conveyor, and Shakes the Metal through Sizing Screens, While the Tickets are Drawn by a Suction Fan into the Hopper at the Right. The Jogger and Fan are Driven by Individual Motors of One-Twelfth Horsepower

HOW A STREET RAILWAY COUNTS ITS RECEIPTS

BY ALLEN P. CHILD

THERE are not many of us who find it necessary to have machinery for counting the money we earn in our daily occupations. But a street railway, with its receipts hundreds of thousands of fares a day, is forced to abandon the old counting-house system of sorting and counting by hand. The company operating street cars in Kansas City, Mo., uses some interesting machinery, designed and constructed in its own plant, for sorting and counting coins, metal tokens, and paper tickets.

By two o'clock in the morning the receipts of the day before are entirely counted, the tokens and tickets are ready for a new round trip or destruction, and the money is sacked ready for the bank. With the single ride being sold for eight cents, tickets selling for seven cents in stated quantities, and metal tokens two for 15 cents, there is an immense daily accumulation of coins of various denominations which would be impossible to sort and count by hand. Of the total receipts, 28 per cent show up as tickets, an average of about 100,000 daily, while 58 per cent are represented by 185,000

A General View of the Street-Car Company's Cash Room: All the Currency is Counted, Checked, and Prepared for Banking at the Table on the Right, the Tickets being Weighed and Tabulated at the Left-Hand Table

metal tokens. The remaining 14 per cent consist of 26,000 nickels, and 85,000 pennies, besides many coins of larger denominations.

Starting out about one o'clock every morning, the money car makes the rounds of the various divisions. The lock-box magazines are removed from the cars at the termination of their runs, at the divisions, and their contents are dumped into strong boxes. Each box contains the fares received from one line. From the divisions the strong boxes are brought to the counting room.

First the metal tokens and coins are separated by a machine from the paper tickets. Constructed along the same lines as a jig used in the mining industry for separating ore, this machine causes the metal pieces to drop through a series of apertures, and the paper tickets are left in a separate container. The machine is operated by two men, one at the feed table and one at the tills. At the left of the machine, a revolving table receives the contents of the strong box. The contents are deposited in the first jogging compartment by being fed onto a belt conveyor. A vacuum-suction nozzle removes the paper tickets from the mass while the jogging process is going on. Coins and metal tokens pass through a screen to a position where they pass through a series of screens, each having an aperture for one denomination. The paper tickets are drawn into a hopper, from which they are weighed and checked. From the tills the coins and tokens are taken to standard counting machines. The power for operating these machines is supplied by two ½-hp. motors. One of the motors operates at 1,500 r.p.m. and drives the suction fan, while the other operates at 1,700 r.p.m., supplying power for the conveyor belt and the jogger. Three hundred thousand coins, tokens, and tickets may be separated by these machines every hour.

Two of the Machines for Counting Metal Tokens: They Record All the Pieces That Pass through Them, Rejecting Spurious and Imperfect Ones

The automatic counting machines register the number of pieces passed through the mechanism. Three machines count metal tokens, while one each count

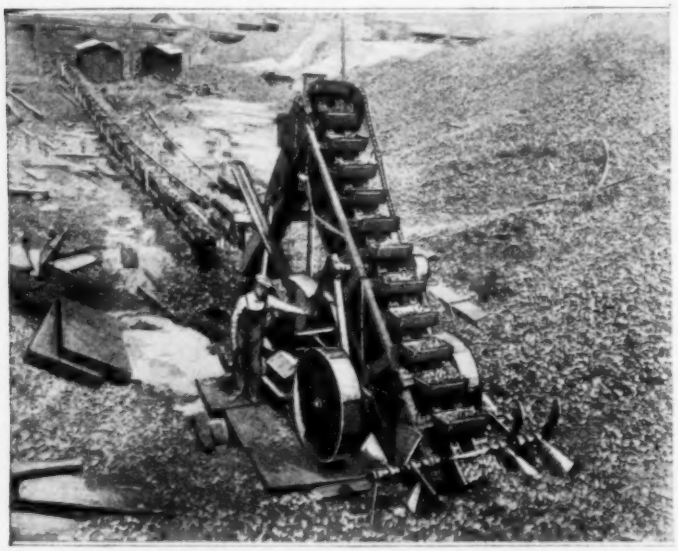
The Motor-Driven Ticket-Tabulating Machine, from Which the Tickets Go to the Weighers, and Then are Destroyed

nickels and pennies. Coins of larger denomination are counted and bundled by hand. After the pieces are counted and put into canvas bags, the amount is checked by weighing on sensitive scales. After the count has been found correct by tabulation and weight, the bags are closed with a lead seal, $50 in nickels, $10 in pennies, and 500 tokens to the bag. The cash is sent to the bank while the tokens are thrown into circulation again.

Tickets are checked by weight only. The paper on which they are printed is of a special composition, weighing, within the fraction of an ounce, the same, sheet for sheet. After the tickets have been properly tabulated and the result checked by weight they are passed on to a machine which destroys them.

CONVEYOR AND SELF-MOVING LOADER REMOVE CULM HILL

A coal-mining company of northern Pennsylvania recently disposed of a large hill of culm in a short time, despite labor shortage, by means of a flight conveyor and one of the self-propelling, self-feeding loaders described in Popular Mechanics Magazine for June, 1920. The loader first attacked the hill at one edge, and, followed by the extensible conveyor, soon formed a narrow valley. It was then turned through 90°, and was crowded into the sides of the valley, discharging the culm meanwhile upon the nearest part of the conveyor. When both sides of the cut had been eaten away in this fashion, the loader was steered straight into the hill again, as at first, and the process was repeated. The results obtained in this way seem remarkable when it is considered that the two mechanisms required the attention of only one man.



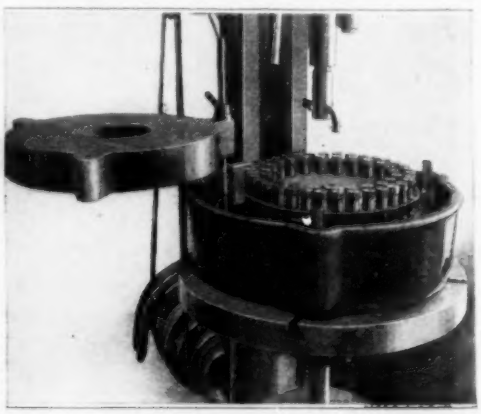
The Shacks in the Background Marked the Foot of the Hill of Culm When the Flight Conveyor and the Self-Propelling Loader Started, Almost without Human Attention, to Remove the Pile

SCOTCH MUNICIPALITY WILL MANUFACTURE CHEMICALS

Recent extension of facilities has made the city of Glasgow, Scotland, through its chemical-works department, a serious manufacturer of benzol, pure and for motor use; toluol, light and heavy naphthas, tar, carbonic acid, and possibly dyes and intermediates. The profits from these by-products are expected to reduce the cost of gas to the consumers.

MACHINE MAKES ACCURATE STANDARD-GAUGE BLOCKS

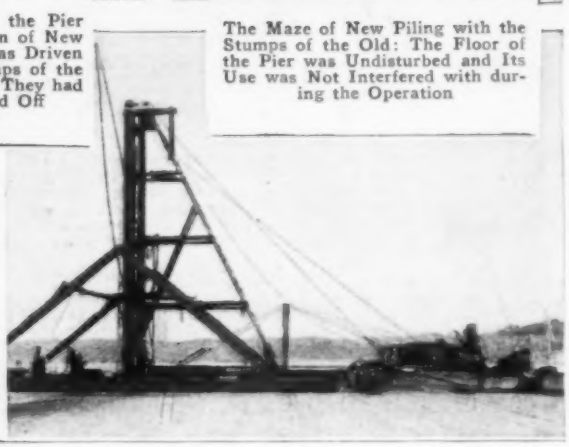
Mass production of gauge blocks, accurate to within a millionth of an inch, is made possible by a machine developed at the Bureau of Standards. This machine consists essentially of two thick annular disks, one at the top and one at the bottom, the faces of which form lapping surfaces. The gauges are held in position by a disklike frame, provided with holes in which the gauges are placed. This frame, in contact with the gauges at the middle of their lengths, propels them during the lapping process. The top lap is swung over and lowered on to the top ends of the gauges, resting freely but being prevented from turning. The spindle is lowered until a bent finger, fixed in it, engages a hole in the center of the retaining frame of the gauges. The spindle is then revolved, causing the center of the disk to move in a circle. This drags the gauges about between the lapping surfaces, giving a progressive turning of the frame and gauges between the laps. Each gauge turns in its hole, the motion being determined by the circumstances of the abrasive action at the ends. The abrading material is suspended in a light oil



Machine for Making Accurate Gauge Blocks: The Upper Lapping Disk is Turned, Showing the Gauges in Place

Holes Made in the Pier for the Insertion of New Piling Which was Driven beside the Stumps of the Old Piles After They had been Blasted Off

The Maze of New Piling with the Stumps of the Old: The Floor of the Pier was Undisturbed and Its Use was Not Interfered with during the Operation



Left: Front View of the Driver Used to Sink the New Piles into Place beside the Old Ones. Right: A Side View of the Pile Driver and the Air-Compressing Apparatus for Operating It, by which the New Wooden Piles are Driven through the Holes in the Pier Floor

which is applied through a hole in the top lap. The secret of success of the method lies in the periodical turning of the gauges, end for end, and in shifting them from one side to the other of the retaining frame, the combined operations causing all the gauges to become of the same length, with opposite faces accurately parallel.

JAPAN MAKING EXPERIMENTS IN SHEEP RAISING

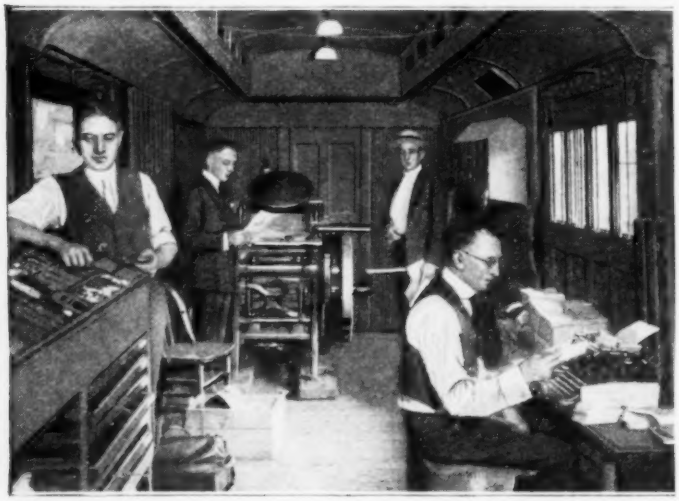
Experiments in the raising of sheep are being conducted by the agricultural department of the Japanese government, representatives of which have recently purchased some 200 Shropshire and 50 Corriedale ewes while on a mission to Australia. A number of rams has already been sent to Japan from England. It is reported that the total number of sheep now in Japan does not exceed 4,000 to 5,000, of mixed breeds.

NEW PILES PUT UNDER OLD PIER BY NOVEL METHOD

Without disturbing the floor of the pier, or interfering with its use, a contractor is placing new piles underneath the municipal pier at Santa Monica, Calif., which had been condemned as unsafe.

The operation involves the removal of the concrete piles on which the pier was supported, and the installation of new wooden ones, and the work is being accomplished in an original and novel manner. The locations of the old piles are ascertained and holes are cut in the floor, after which the old piles are blasted out. Later, a new pile is lowered through the hole and driven beside the old stump. By this method of renewing the foundation a pile at a time, every pile will be new, but the floor will be in the same location, with nothing but the patches to indicate the change.

DAILY NEWSPAPER PUBLISHED IN BAGGAGE CAR

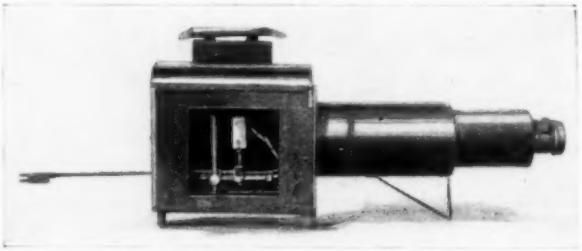


A Railroad Baggage Car Converted into a Full-Fledged Publishing Plant, Editing and Printing a Daily Newspaper: The Full Staff of Pressman, Reporter, Compositor, and Editor Appears in the Picture. The "News" was Gathered on the Train, Supplemented by Telegrams from Home Picked up at the Stations, Printed in the Afternoon, and Distributed to the Passengers Less than an Hour Later

Because a party of Ohio business men refused to change their daily-newspaper habits while traveling to California to attend a recent convention, the baggage car of their train became a full-fledged publishing office for five days. With an equipment of hand press, type case, and typewriter, an office force of editor, compositor, pressman, and a reporter to gather the news of the day from the passengers, the paper got to press on time every afternoon, and less than an hour later copies were distributed on the train. Wire messages picked up at stations supplied features.

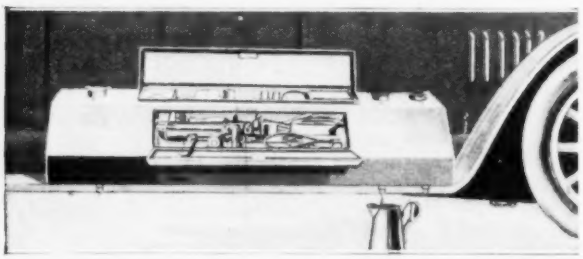
ACETYLENE FOR MOVING-PICTURE PROJECTION

In localities where there is no source of electricity for the operation of an arc lamp, an improved acetylene lamp has been developed for the projection of moving-picture films. This lamp is built on the principle of the familiar calcium light, the acetylene flame impinging at an angle upon a core of thorium, which produces an even and intense illumination. The acetylene is supplied from a tank of the "dissolved" gas which is to be obtained almost anywhere at small expense and, in most instances, without delay.



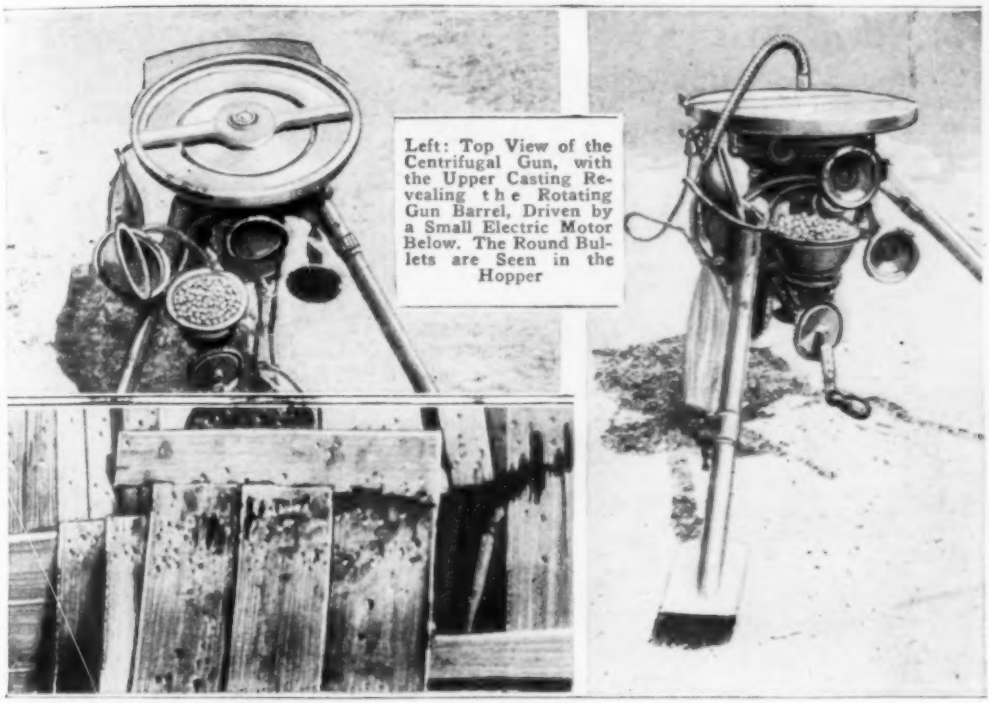
Acetylene Lamp for Projection Purposes: The Flame Strikes a Core of the Element Thorium and Produces an Intensely Brilliant Light

FUEL TANK CARRIES WATER, FOOD, AND TOOLS



An Emergency Fuel Tank That Carries a Reserve Supply of Gasoline and Lubricating Oil: Compartments are Also Provided for Tools and Supplies, Water, and Provisions

A new fuel tank for the automobile, that is carried attached to the running board, has several distinctive features that will commend it to the motor tourist. The tank is divided into several compartments which are used for the storage of gasoline, lubricating oil, water, tools, and provisions. It is claimed that the nearness of the food to the fuel does not impart a gasoline flavor to the former.



Left: Top View of the Centrifugal Gun, with the Upper Casting Revealing the Rotating Gun Barrel, Driven by a Small Electric Motor Below. The Round Bullets are Seen in the Hopper

PHOTOS BY GILLIAMS SERVICE

Left: A Target of Planking, Shattered by 40 Seconds of Firing from the Centrifugal Machine Gun. Right: The Gun Set Up Ready for Action, with the Tube in Place by Which the Bullets are Fed to the Barrel

WAR DEPARTMENT TESTS NEW CENTRIFUGAL GUN

Centrifugal force, the mighty power that sometimes sends fragments of heavy flywheels crashing through brick walls, is bound to become a potent weapon of warfare if persistent inventors win their way. The War Department has recently made tests of a new form of centrifugal machine gun, invented by two New York men, the feature of which is an ingenious timing device. By this means a ½-in. round bullet is deposited in the rotating barrel at each revolution, so accurately timed that it issues in a mathematically exact line.

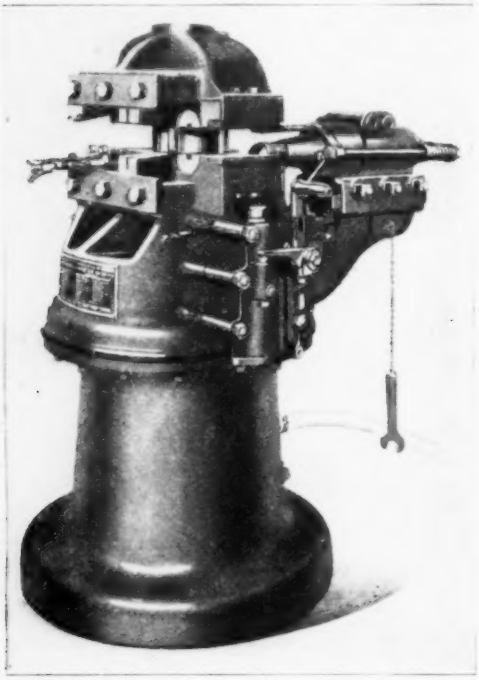
The barrel, 8 in. long and with its muzzle 9 in. from the center of revolution, turns horizontally on a vertical shaft, and is inclosed in a disklike casing. A battery-driven electric motor turns the shaft, which is declared capable of a speed of 10,000 r.p.m. The inventor claims a muzzle velocity of 850 ft. per second. A simple computation shows that rather more than 10,000 r.p.m. would be necessary to achieve this result, and the government test indicates a firing capacity of 2,000 balls a minute instead of 10,000. The bullet-feeding gear may be turned by hand, or by the driving motor. The obvious advantages of a centrifugal gun are the absence of smoke and flash, and a firing sound less easily located than the staccato explosions of a powder gun.

TALKING-MACHINE NEEDLE PLAYS 10,000 RECORDS

Because the point of the ordinary phonograph needle is conical, the wear on both needle and record groove is excessive. A new needle has been brought out, which, it is said, will play 10,000 records before a change will be necessary. This remarkable performance is claimed to be the result of using a needle of uniform diameter which fits into the record grooves instead of riding on top of them as with the ordinary needle. The two cross-sectional views show how the new needle fits into the grooves and how the record is worn down by the ordinary needle.

IMPROVED MACHINE SHARPENS STEEL DRILL BITS

To keep a full supply of properly pointed bits on hand for the "hard-rock" men on big construction contracts, or in stone quarries, by any other than machine methods would be almost impossible. An improved drill sharpener, that operates by compressed air, has been built for rapidly sharpening bits of any section up to 1⅞ in. in diameter. Aside from its function as a drill sharpener, special dies can be used, by means of which bolt heads can be made and upward of 200 swaging operations of a similar character executed.



This Machine, Driven by Compressed Air, is Specially Built for Sharpening Rock Drills Uniformly and Rapidly, but with Proper Dies, Some 200 Other Operations can be Executed with It

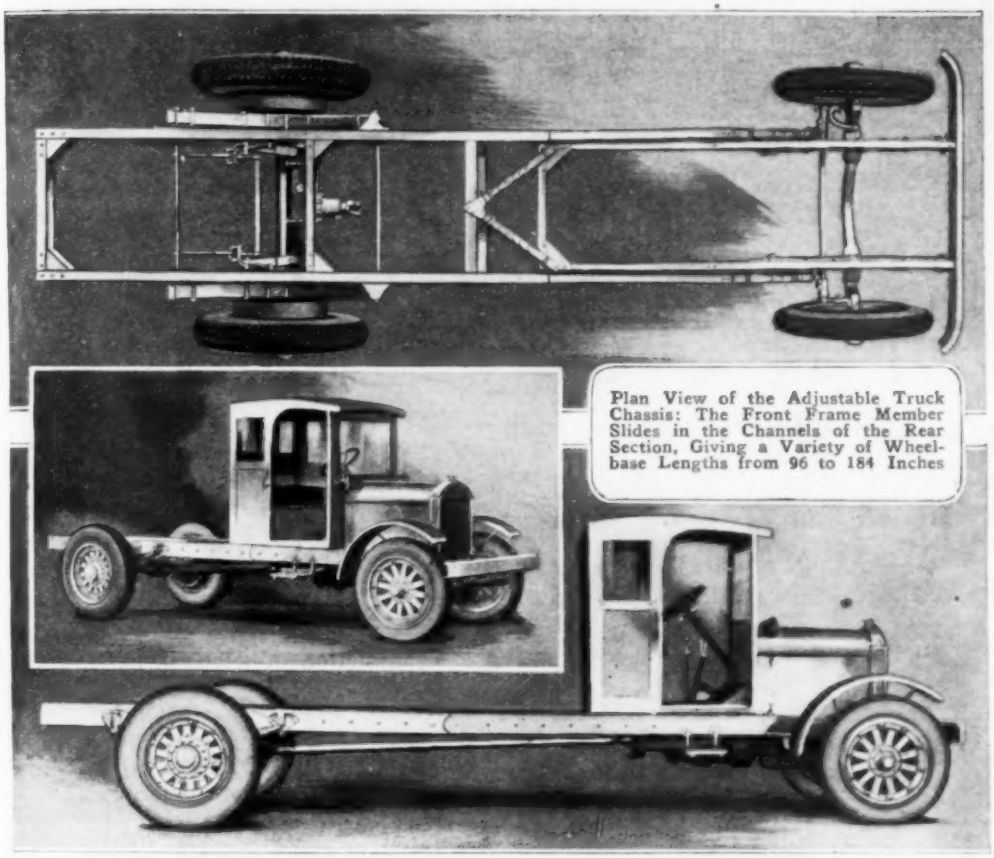
WOMAN HELD EIGHT MINUTES UNDER WATER BY AUTO

Because the top of an automobile acted as a shallow diving bell when the car ran off a bridge into a California canal, a woman passenger was enabled to live under water for eight minutes, until her rescue could be effected. The machine, breaking away 30 ft. of bridge rail, was completely submerged by its plunge. The driver and two other men escaped by swimming, but the woman was caught under the top in such a way that the air pocketed within it served to keep her alive. Her rescuers were guided by the lights of the car, which continued to burn in the depths of the canal. Later the auto itself was recovered.

SIGNPOST CHARACTERS CUT INTO WOOD BY MACHINE

Instead of the time-honored practice of painting railroad-section and mileposts, surveying stakes, and the like, an improved process has been developed whereby the characters are cut into the wood. An iron stencil is used, and the characters are brought into proper relation by means of a lever on the device. In use, the stencil is placed in a routing machine and the stake to be marked is placed beside it; the cutter follows the outline of the character and carves it into the wood.

Left: Cutting the Lettering into Signposts Instead of Painting or Stenciling. Right: The Iron Stencil Used and a Sample of the Work It Produces



Plan View of the Adjustable Truck Chassis: The Front Frame Member Slides in the Channels of the Rear Section, Giving a Variety of Wheelbase Lengths from 96 to 184 Inches

The Adjustable-Length Truck Contracted, in the Inset at the Left, to Its Minimum Wheelbase, and Expanded, at the Right, to the Maximum Length: The Sliding, Forward Frame Carries the Cab and Engine

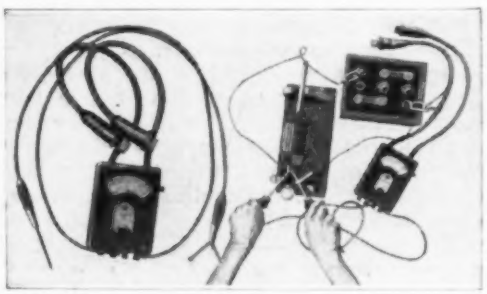
ADJUSTABLE-LENGTH FRAME FOR MOTOR-TRUCK CHASSIS

The advantage of quickly and easily changing the wheelbase length of a truck is apparent, particularly where the machine is used for a number of specific trucking operations. In a new chassis, maximum and minimum length as well as various sizes between the two extremes can be easily secured. The main load-carrying frame is of double, pressed-steel channels, additional strength and rigidity being obtained by one sliding within the other. The forward, small frame carries the motor, transmission, and cab. It is mounted within the main frame by cantilever springs of special construction.

¶Eagles are classed with wolves and similar predatory "vermin" in Alaska, where their extermination is urged, to put a stop to their enormous destruction of fish and game.

VOLT-AMMETER OF COMPACT DESIGN FOR TESTING

Particularly intended to be used for testing electrical circuits in automotive work, a very compact and convenient



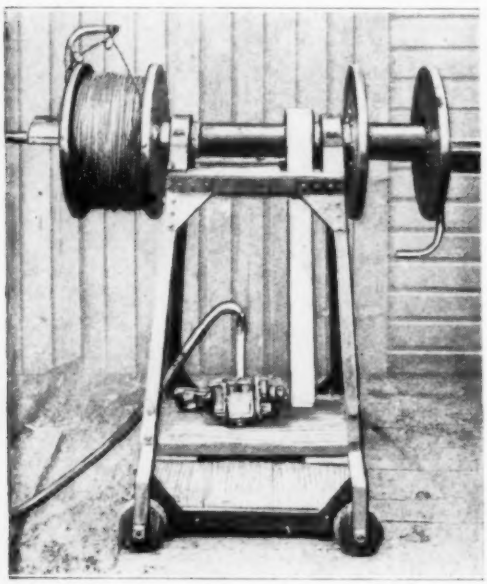
A Compact Form of Volt-Ammeter Particularly Designed for Testing Electrical Circuits and Storage Batteries, and for Trouble-Hunting in Automotive Work

volt-ammeter has been brought out. The instrument records from 0 to 30 volts and to 300 amperes, the change from volt-

meter to ammeter being made by turning a small switch on the side. At zero, the needle is at the center of the dial, and it is claimed to be impossible to injure the instrument by reversal of the current.

SHIP'S RIGGING WRAPPED WITH TARRED YARN BY MACHINE

Ever since steel cables have taken the place of hemp cordage for ship's rigging, it has been the practice to wrap them with tarred rope and yarn as a protection against the corrosive effect of salt water. Hitherto the work of wrapping has been



A Machine for Wrapping Ship's Rigging with Tarred Yarn: The Cable is Fed through the Hollow Shaft, While the Drum Containing the Yarn is Revolved around It

practically all done by hand. As the result of long experience at this work, an inventor has produced a practical machine which, it is claimed, will turn out more work in a day than 30 men by the hand method. The machine will wrap four feet of cable a minute, while the average by the hand method is some six or eight feet an hour.

ROCK SLIDE IN NIAGARA CAVE DEALS DEATH TO TOURISTS

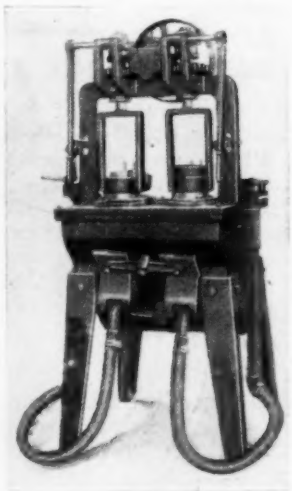
That even the precipice of solid rock over which Niagara hurls its torrent is not immutable was gruesomely demonstrated a short time ago, when a slide of shale in the famous Cave of the Winds, behind the falls, brought death to three tourists and injury to a number of others. Warning sounds of the impending disaster were inaudible in the roar of waters, and the falling rock crashed down upon a bridge in the cave just as the victims were crossing it, while flying fragments bruised many of the hundred or more other visitors. The bodies were recovered only when the steamer "Maid of the Mist" dispatched a rowboat on a perilous journey around the cataract.

STANDARDIZED LUMBER SIZES IMPORTANT TO INDUSTRY

Standardization of the many and varying sizes of lumber products, a problem now being studied by lumbermen, is an economic step of great importance to the building industry. Not only will much time be saved to architects and contractors in preparing designs, specifications, and lists, but changes may be made in the kind of wood used without refiguring the sizes. Uniformity in construction and elimination of waste in shaping different grades to match are other advantages.

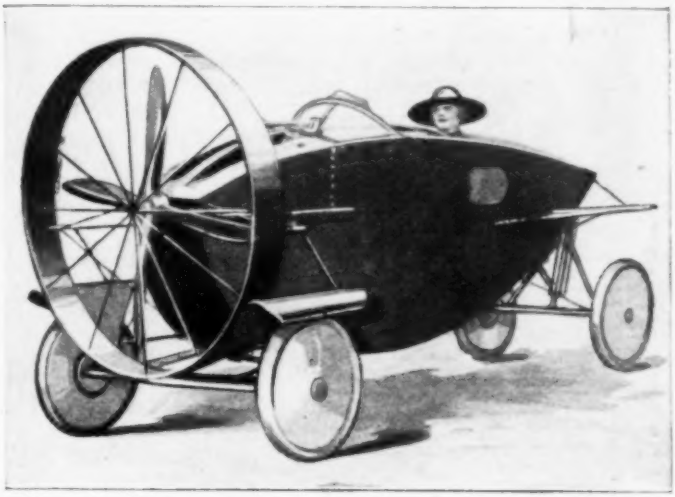
MACHINE FOR CLEANING INTERIOR OF PISTONS

For finishing and cleaning the interior of automobile-engine pistons with steel grit, or shot, a special machine has been designed. The pistons are placed in a holding jig, skirt down. The steel shot, or other material, is blown into the piston through a nozzle underneath. A quick-opening valve on the air line controls the operation of a special injector which draws the grit from a hopper in the base of the machine. During the operation, the pistons are revolved mechanically so that every part of the interior is finished.



AIR-PROPELLED AUTOMOBILE OF FRENCH DESIGN

A light automobile, of French design, is driven by an air screw which is direct-connected to a motorcycle engine concealed under a streamline body of plywood. The car will carry two persons seated side by side and is so deep that only their heads are exposed; a windshield offers further protection against the rush of air from the propeller. The latter is inclosed by a substantial guard to prevent accidents. The fuel consumption is very low. There is no differential, and steering is done through the rear wheels. The car can travel at 50 miles an hour.



A Light Automobile of French Design That Has a Number of Unusual Features: It is Propelled by a Four-Bladed Air Screw Direct-Connected to an Eight-Horsepower, Two-Cylinder Motorcycle Engine. It Has No Differential and is Steered by a Control Wheel Acting on the Rear Wheels

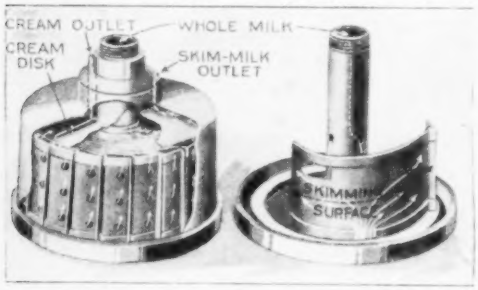
BABY CHRISTENED ON SWAYING STEEL GIRDER

On a narrow, swaying steel girder, 120 ft. above the street, Marjorie Hope Powell, of Tacoma, Wash., was christened recently in the presence of hundreds of shoppers and some 50 structural workers, who acted as godfathers. The christening party, with the baby in the arms of its father, climbed up shaky ladders, over isolated girders and sagging planks to a temporary staging on the tenth floor. The baby was placed in the arms of a steel worker, who, with the minister, mounted a girder at rest on the platform. The girder was then hoisted up 15 ft. and swung far out over the street. Amid the rattle of rivet guns, the crashing of boards, and various other noises from the street below, the words of the ceremony were pronounced, and the girder swung back to its initial position on the tenth floor. Throughout the ceremony the baby crowed with delight.

A Baptismal Ceremony in the Air, with the Baby and the Minister, Guarded by a Professional Steel Worker, Suspended on a High Girder, Which was Swung Out 120 Feet Above the Street Level After the Little Party had Mounted It. The Inset Gives a Close-Up View of the Unusual Christening

EFFICIENCY OF SEPARATOR IMPROVED BY NEW DISK

A more complete separation of butter fat from the whole milk is the purpose of a new straight separator disk, which



Left: The New Cream Separator with the Casing Broken Away to Show the Construction. Right: A Detail, Indicating the Skimming Surface

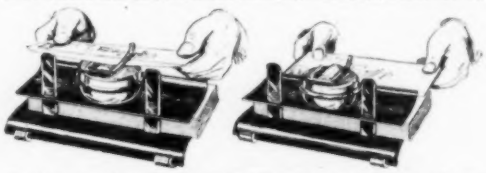
is claimed to be much more efficient than the cone-shaped element previously used in cream separators. In the new separator, the whole milk flows first to the bottom, and enters each disk at its center, which gives the butter-fat particles a chance to slip back toward the cream outlet and out of the way of the heavier milk particles, while in the older machines, the milk enters the separating element at the top. It is claimed for the new disk that it leaves only .0003 per cent of butter fat in the skimmed milk.

NARROW SLOT IN ODD BRIDGE LETS SAILBOATS PASS

Economy and ingenuity joined forces in the construction of a queer bridge that now connects an island to the mainland at Canso, Nova Scotia. The structure, built of logs, is low and practically solid, yet it readily permits tall-masted sailboats to pass through it. Across the floor of the center span, from side to side, is a narrow slot, with a board, hinged at one side, as a cover. When a boat has been steered to this scanty opening, the cover is pushed back, the mast and sail worked through, and the cover closed again from the deck. Timbers arranged in a "V" at each side of the bridge help guide the mast into the opening.

SIMPLE ENVELOPE SEALER FOR ALL SIZES AND SHAPES

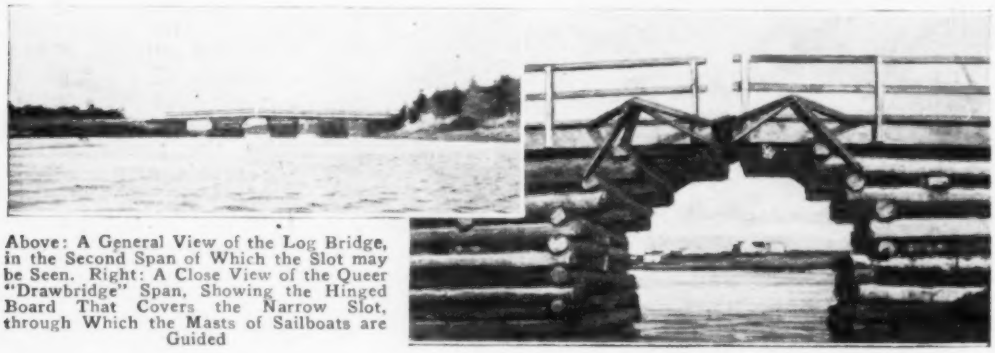
A simple and durable envelope sealer provides an economical arrangement for moistening and sealing the individual output. It is particularly of value in the office where it is impossible to assemble all the mail in one department. An absorbent pad equipped with a spring clip for guiding, moistens the flap of the envelope as it is drawn over it. The sealing is accomplished by simply pushing the envelope under the sealer plate, the



Left: Moistening the Flap on the Roller. Right: Sealing the Envelope by Pushing It under the Plate

weight of the roller and plate being ample not only for this operation but also to keep the mail intact until mailing time.

¶Eskimo curios and relics to the number of 20,000 are included in the remarkably complete collection of the Territorial Historical Museum at Juneau, Alaska. This interesting and valuable display, representing a collecting work of 10 years along the coasts of Bering Sea and the Arctic Ocean, and in charge of a native Alaskan, is now open to the public.



Above: A General View of the Log Bridge, in the Second Span of Which the Slot may be Seen. Right: A Close View of the Queer "Drawbridge" Span, Showing the Hinged Board That Covers the Narrow Slot, through Which the Masts of Sailboats are Guided

The Scene of the Arctic "Rodeo" Is a River, upon the Ice of Which Lies a Thick Blanket of Snow. This Picture was Taken from a Promontory 150 Feet above the River. It Shows the Delegates from All the Herds in the Vicinity Preparing for the Contests

"RODEOS" NORTH OF ARCTIC CIRCLE

BY LAWRENCE WILLIAM PEDROSE

IN the vicinity of the Kobuk River, Alaska, 50 miles north of the arctic circle, there are held annual "rodeos," which for picturesqueness, skill of exhibitions, and in popularity are comparable to the "round-ups" of the western part of the United States—yet there is not a single horse or steer or saddle or "six-gun" within hundreds of miles of the scene.

These rodeos are conducted under the auspices of the United States Bureau of Education for the natives of Alaska. Western round-ups are held solely for purposes of entertainment and do little or nothing to advance the cattle industry. But the arctic rodeos are staged for the definite purposes of education and advancement of the reindeer industry, and in this they have been remarkably successful.

Importation of reindeer into Alaska began in 1892, when 80 animals were obtained in Siberia for experimental purposes. In the succeeding 10 years, 1,200 animals were brought over. From this nucleus the present Alaska reindeer service grew. Today there are approximately 150,000 reindeer in the territory, distributed among about 80 herds, 70 per cent of which are owned by natives.

The economic value of the reindeer to Alaska is said to be incalculable. The Eskimo is by nature a hunter and fisherman. But the commercial greed of the white man has partly destroyed the fish and game of the territory, gradually eliminating the native's means of sustenance. Primarily to save the Eskimo from extinction, the reindeer service was established. Within less than a generation, because of the interest taken in them by the government, the Eskimos throughout northern and western Alaska have been advanced through one entire stage of civilization: from making their living by the precarious wild-game chase to the pastoral stage, in which, by their own industry, they have provided against want and established a basic industry which will some day be of vital importance to the civilized world. The government looked upon the reindeer industry as practical vocational training for the Eskimo and something which would guarantee him food, clothing, and transportation, and at the same time make of him an independent, responsible citizen.

A system of apprenticeship has been established for distributing the reindeer among the natives. The term of apprenticeship is four years. At the end of the first year the herder, if his service has

The United States Bureau of Education Furnishes a Tent for Exhibits Which Serves as Sleeping Quarters for the Visiting Reindeer Men. This Huge Tent Was a Great "Hit" with the Natives, Who were Greatly Awed

been satisfactory, receives six deer; at the end of the second year, eight deer; at the end of the third year, 10 deer, and at the end of the fourth year, again 10 deer, making a total of 34 deer. With the approval of the local superintendent, he may kill the surplus males and sell the meat and hides.

Having completed his apprenticeship, the native is sole owner of a herd of 34 deer, plus their natural increase, which would make a total of 40 to 60 deer, but he is still under the supervision of the government, and must in turn train and reward apprentices under the rules and regulations of the service. Thereby the system of distribution becomes automatic. Female deer can only be sold to the government or to natives, and cannot be butchered for meat.

The rodeos and fairs, which are held in January and February, are declared to give great stimulus to the industry, since they develop keen interest among the natives. Although of recent conception, successful meetings have been held at Akiak, on the Kuskokwim River; Shaktoolik, near Unalakleet; Igloo, on the Seward Peninsula, and Noorvik, near Kotzebue. Each succeeding show has been an elaboration upon the others, and every herd in the vicinity now sends a

The Judges Awarding First Prize in Sled Construction: This Sled, Which Has No Bolts in Joints or Mortises, is Wrapped with Whalebone Instead of Rawhide or Sinew. It Weighs About 50 Pounds and will Carry More than Half a Ton

A Contestant in the Long-Distance Race is About to Untie His Deer from the Hitching Peg. The Deer Starts Away like a Shot and the Peg must be Dodged. At a Recent Rodeo a Deer and Driver Made 10 Miles in 37 Minutes 8 Seconds

A Splendid Specimen of Sled Deer and One Which Made a Pulling Record by Drawing on the Level Snow a Sled Loaded with 2,242 Pounds of Sacked Sand

Examining Reindeer Harness for Defects: Eskimos Are the Most Patient Searchers in the World, and Nothing Escapes Their Sharp Eyes

In Voting for the Winning Harness, the Judges Face Away from the Exhibits, Then One by One Turn and Point to Their Choice, Which is Recorded by the Government Representative in the Background

delegation to it. Prizes are awarded in such contests as racing, roping, herding, driving, creation and perfection of equipment, and have engendered a clean, friendly rivalry among herders, which in turn has given impetus to reindeer production and increased interest in all phases of the work.

At the fairs all matters pertaining to reindeer are discussed, and the herders come to an understanding regarding grazing-ground rights and similar matters. Government representatives give talks on reindeer breeding and offer scientific guidance for the development of an improved breed of stock.

In the Butchering Contest This Carcass Won First Prize for Neatness

In the rodeos interest is encouraged in sports of all kinds, so that the natives' new work will replace their inclination for the chase. Awards are made for short and long-distance racing, speed and efficiency in butchering, and sled and team handling on the trail; in breaking to harness wild deer, snowshoe running while leading a deer, sled building, improvements in harness, etc. Out of these contests have already developed a new type of halter which is far more humane than the former jerk line which inflicted punishment on the deer; a sled with a high back, and handles which enable the driver to stand erect on extensions of the runners, and many other features which have increased the efficiency of reindeer handling and transportation.

There is close coöperation between the schools and the reindeer industry. Teachers must spend a week at two different times during the school year at the reindeer camps, to familiarize themselves thoroughly with the future profession of their pupils. Since the natives also operate a string of coöperative stores for handling their furs and other goods, under the paternal eye of the teachers, close understanding results.

In recent years reindeer have been distributed to practically every section of western Alaska, and herds may be found from Point Barrow down to the Aleutian Islands. The animals' food is moss, and the resources of the territory would support millions of them. The natural increase from the present herds is expected to allow for this expansion, and the government is experimenting in improving the breed and in the development of markets for the meat.

Reindeer meat has been sold to the people of Alaska for many years, and until recent years the supply has not exceeded the local demand. Prospectors often purchase sled deer in the fall for transporting their supplies on the trail; on arriving at their destination, the deer are butchered and utilized as food. This practice is becoming more prevalent as its economic importance is realized. Recently serious consideration has been given to a means of exporting the growing thousands of surplus deer to the United States.

A coöperative cold-storage plant, operated as well as owned by native reindeer men and under the supervision of the educational department, is being advocated. This would enable the natives to keep the reindeer market open winter and summer, and facilitate shipment outside the territory. Within the next year or two, it is anticipated, a market for distributing the meat will be established in the United States.

For the native, reindeer raising holds great promise. It costs less than $3 per head to raise the deer, which will dress 150 lb. of choicest meat selling at 20 to 25 cents a pound, or more than $30 per carcass. Besides, the hide is useful for clothing, and many other purposes. The owner of a herd is a rich man in his native land, and the Eskimo maid who marries a deer man considers herself very fortunate.

¶A record iron-ore shipment recently unloaded at Cleveland consisted of 13,912 tons of 2,240 lb., or the equivalent of about 15,581 short tons. This constitutes a cargo seldom, if ever, carried by an ocean-going ship, and at no seaport can cargoes such as this be handled with the speed and economy that mark the lake docks.

The Rules of the Contest Are That the Driver must Bring His Deer In. If the Deer Balks at Pulling Him In, He must Pull the Deer In. The Contestant in the Illustration is Striving against These Odds

This Driver Had a Wild Deer. He Was Inexperienced and Frightened the Animal, Which Turned Suddenly near the Mile-post and Tried to Burrow under the Sled

The Sled-Tying Contest: This Tying must be Done Securely, as the Deer Is Likely to Turn the Sled Over. Rifle and Snowshoes must be Fastened Outside, and the Canvas must be Snow-Tight

Representatives from the Kivalina Station: These Men Are All Experts and Capture a Majority of Prizes in All Events—Note Their Medals and Ribbons. The Station Director and His White Wife and Son Are at the Extreme Right

PORTABLE STONE CRUSHER FOR CONTRACTORS' USE

A light, portable stone crusher can be used to advantage by concrete-paving contractors for crushing old walks and

A Light, Portable Stone Crusher Which can be Taken to the Job for Breaking Up an Old Pavement to Furnish Aggregate for a New Concrete Walk

using the product for the aggregate in a new one at a saving of time and expense to both builder and customer. The machine is about 14 ft. long and is operated by a gasoline engine.

NEW LAUNDRY MACHINE HUNG ON STATIONARY TUB

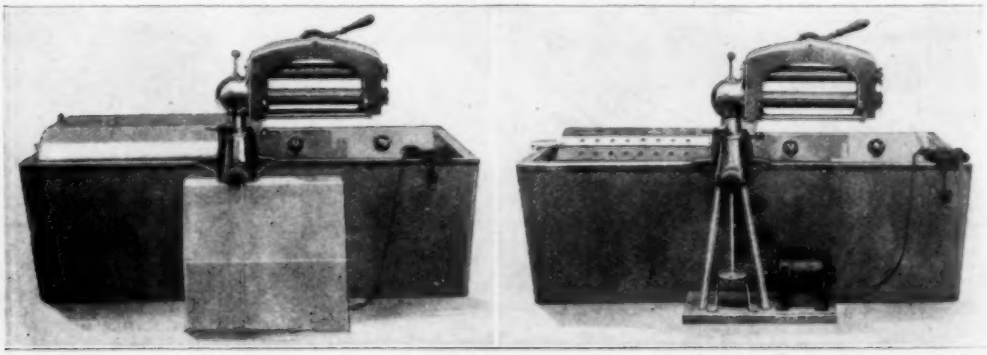
A household laundry machine of recent invention is unusual in that it is simply an attachment for the stationary tub, or tubs, found in the basement of the usual city residence. The apparatus can be most easily described as consisting, first of all, of a vertical shaft which is hung by means of a saddle to the edge of the tub. At the base of the shaft and turning it through bevel gears, is an electric motor. At the top of the shaft is a gear casing from which are driven the revolving clothes drum and the pivoted wringer. When the machine is in operation two splash-proof covers are applied, one to the tub in which the drum revolves, and the other to the motor and the vertical shaft.

ODD HOMES BUILT IN DESERT FOR SECTION HANDS

In the burning stretches of the Salton Sea Desert of southern California, where the mercury climbs regularly to 120° in the shade—if mesquite and other meager desert growths can be said to afford any shade—the railroad provides for its maintenance men and section hands the most comfortable bunkhouses possible. These are, indeed, nothing but old box cars; yet they are made quite livable by a little ingenuity of arrangement. Each is placed on a foundation which raises it about a foot from the ground to permit circulation of air; then, two and two, the cars are covered with canopylike roofs, beneath which plenty of space is left, simi-

Two and Two, the Desert Bunkhouses are Covered with the Canopylike Roofs, beneath Which Plenty of Space is Left for Air Circulation

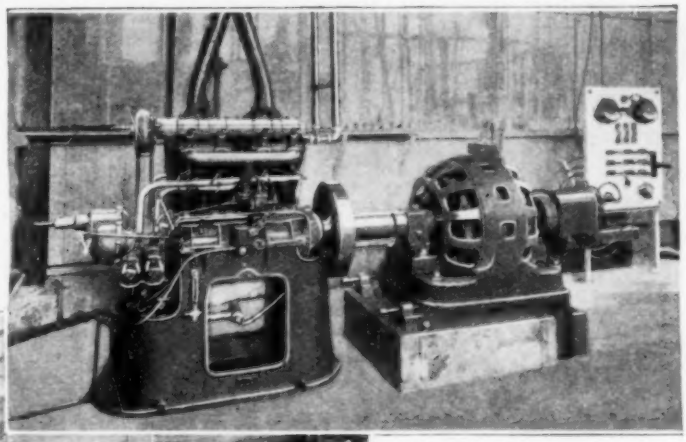
larly, for air flow. Finally, a coat of pale, nonglaring yellow paint is applied to each improvised house.



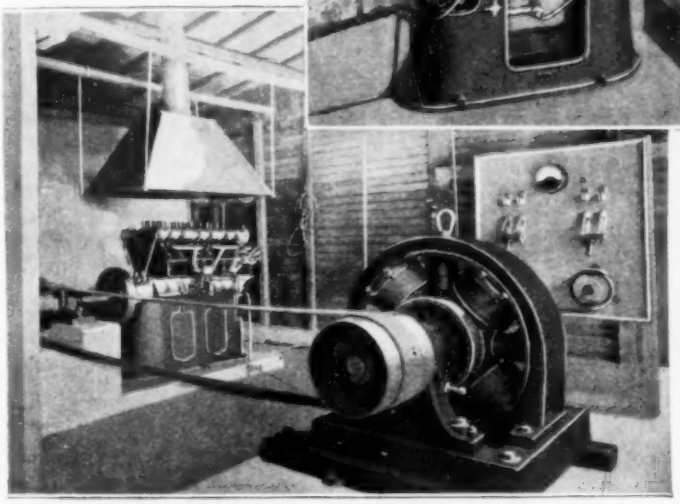
Left: The Stationary-Tub Washing Machine Ready for Use, with Splash Covers in Place. Right: The Splash Covers Removed, Revealing the Clothes Drum and the Electrically Driven Vertical Shaft

AERO ENGINES DRIVE PUMPS AND DYNAMOS

One famous French manufacturer of automobiles, who built thousands of airplane engines during the war, now finds his huge plant at Bellancourt so encumbered with surplus stock that he has put many of them to work. They drive pumps, air compressors, and similar machines, but are most often connected to small dynamos. Two engine types, in particular, are employed for this purpose—an "8" and a "12." The cylinders of both are arranged V-fashion, with camshafts overhead, and with double spark plugs energized by four magnetos. The smaller engine is rated at 100 to 130 hp., the larger at 150 to 200 hp. They are customarily installed on special iron beds.



Airplane Motors Converted to Peace-Time Uses: The Photograph Shows an Eight-Cylinder Motor, Rated at 100-130 Horsepower, as the Source of Power for a Motor-Generator Set



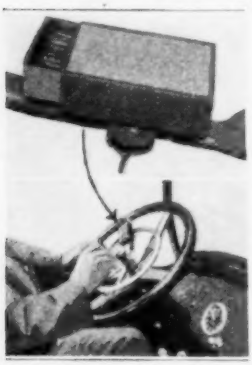
One of the 12-Cylinder, 150-200 Horsepower Motors, Operating a Large Electric Generator: Special Iron Bases are Furnished for Supporting the Engine from the Floor

HAY-RAKE ATTACHMENT FOR MOTOR TRUCK

One of the latest things a motor truck has been called upon to do is to rake hay in the harvest field. A Kansas farmer who wanted to expedite the harvesting of his hay crop, rigged up a sweep rake which he attached to the front of his motor truck. The combination of truck and sweep rake is particularly convenient in cases where a loader is not used. The rake is controlled from the platform, back of the driver's seat, by means of a long lever which raises and lowers the implement for clearing obstructions in the field.

A Kansas Harvesting Arrangement: The Sweep Rake is Pushed by a Motor Truck, and Lifted by the Long Lever Back of the Driver's Seat

MATCH-BOX HOLDER CLAMPED TO STEERING WHEEL



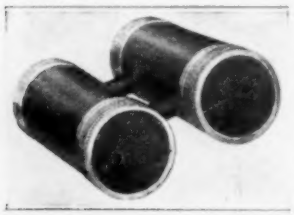
Most motorists know how annoying it is to drive with one hand while fumbling through innumerable pockets with the other in search of a match to light cigar or cigarette. Appreciation of this condition has lately resulted in the appearance of a new advertising novelty. It consists of a match-box holder which displays the name of the merchant and is fastened to a spoke of the steering wheel by means of a clamp and bolt.

QUICK-GENERATING KEROSENE BURNER FOR RANGE USE

A recently designed kerosene burner that is intended to fit into any ordinary coal range, eliminates the necessity of carrying coal and ashes. The new burner can be installed in a few minutes. Gas is generated from kerosene, which is fed to the burner by gravity. In half a minute, or less, the burner will generate sufficient gas to operate the device at full efficiency.

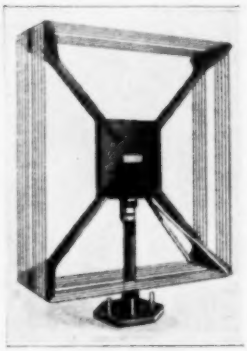
SIMPLE OPTICAL INSTRUMENT DETECTS MALINGERERS

Eye injuries resulting in defective vision are frequent causes of compensation claims, and are difficult to diagnose where the good faith of the subject is in doubt. An eastern physician now has devised a simple instrument which usually discovers the malingerers without difficulty. It consists merely of two parallel cylinders, 4 by 1½ in., mounted like an opera glass, the cap of each having an eccentric ¼-in. aperture. Through these openings the subject gazes at a pair of test cards 20 ft. away, while the operator turns the caps to different positions, and soon is unable to tell whether he is using his good eye or the one alleged to be bad.



COMPACT LOOP AERIAL FOR RADIO AMATEURS

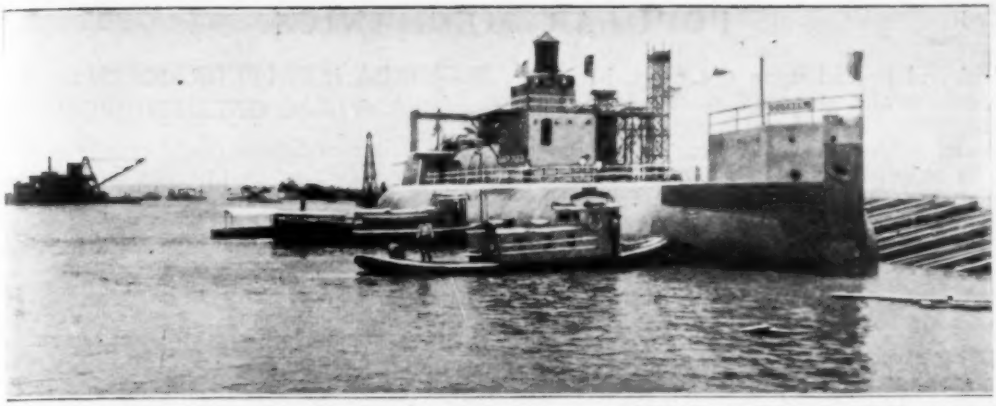
A compact form of loop aerial for wireless amateurs and experimenters has been placed on the market. The use of such an aerial provides the operator with a direction finder and indoor aerial, as it may be set up anywhere in the house. No ground wire is required and static interference, even when there is considerable atmospheric disturbance, is practically eliminated. By turning the aerial, the source of wireless waves is located approximately.



WINDSHIELDS ON SEMAPHORES GUARD TRAFFIC POLICEMEN

During the blizzard of last February the faces of the traffic policemen of Philadelphia were protected against the driving snow and sleet by means of small transparent windshields. Each shield measured about three feet wide by one and a half high, and was carried on an upright rod. This was clamped at the desired height to the standard of the traffic semaphore with which each policeman is equipped.

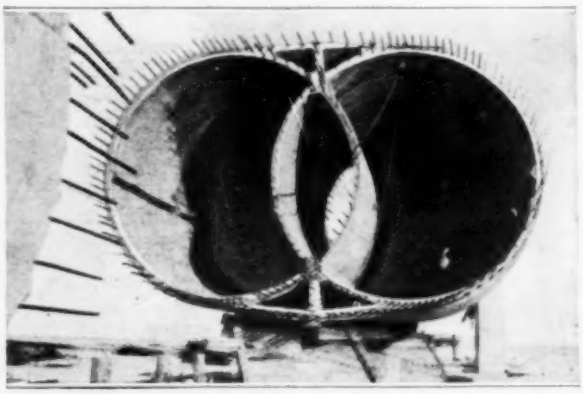
¶A vein of mica is believed to underlie the vicinity of 157th Street and Riverside Drive, New York City, the belief being based on numerous discoveries of fragments during excavations in the neighhood.



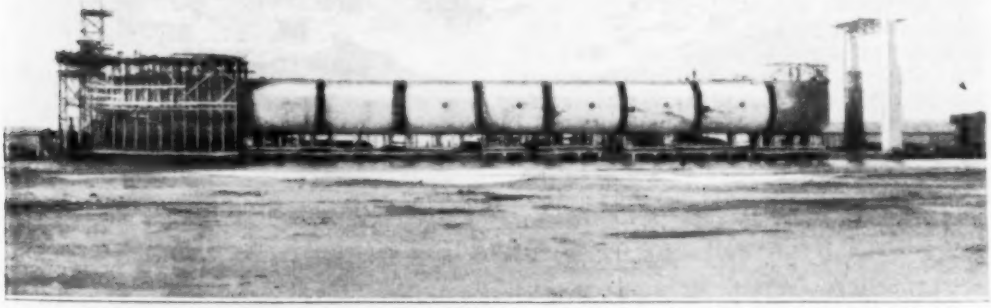
In Outward Appearance, the New Concrete Tank Ship Gives No Hint of Its Peculiar Construction, Resembling the Familiar Whaleback Type of Boat, with Bow and Stern of the Conventional Form

CONCRETE TANKER BUILT LIKE GRAIN ELEVATOR

BETWEEN Tampico, Mex., and Aransas Pass, Tex., there is now in service a concrete oil tanker that was built like a silo. No suggestion of this unnautical construction method is given by its present appearance, however. Riding at anchor, it looks much like one of the whaleback freighters used on the Great Lakes. It measures 298 ft. long, 33 ft. 9 in. wide, and has a load draft of 18 ft. In the bow are the usual chain lockers, etc.; in the stern are the pumping engines, and the internal-combustion engines which revolve the twin propellers. Amidships is the bunk and wheelhouse. The bow and stern were constructed in forms of the type commonly employed in concrete shipbuilding. It is the seven 30-ft. sections composing the straight portion of the hull which were built like so many silos. Each, consisting of two intersecting cylinders, was built in a vertical position by the use of the familiar sliding forms. When seven of these sections had been built and



Looking into the Ends of One of the Double Sections, Comprising Two Intersecting Cylinders of Reinforced Concrete, Connected at Top and Bottom by Slabs That Form the Keel and Deck of the Vessel



In Process of Construction, on the Other Hand, the Big New Tanker did Not Resemble a Ship at All, Looking More like a Horizontal Silo. Each of the Seven Sections was Actually Molded in Vertical Position

laid end to end upon the ways, between the bow and stern, all were joined with concrete. The result was a seaworthy vessel with a cargo space 210 ft. long. The only part of this space not used for carrying oil is the passageway formed by the intersection of the cylinders. Paralleling this, above and below, are four smaller longitudinal chambers used as air passages and as oil conduits from pumps to compartments.

BALANCES ON HANDS AT EDGE OF HIGH BUILDING

Persons who happened to glance up at the top of a certain high building in Chicago on a recent occasion were startled

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Harry McLaughlin, Locklear's Movie Successor, in an Incidental Pose on a Skyscraper Cornice

to the point of experiencing heart-symptoms by the incredible spectacle of a man standing on his hands on the seat of a flimsy chair, at the very edge of the roof. The apparent madman, however, was merely demonstrating his fitness to fulfill the uncompleted movie contract of Lieut. Omar Locklear, recently killed in an unsuccessful aerial feat. Harry McLaughlin, now dead, was the new performer.

¶ Because of the danger in handling so large a quantity of radium, a lot of nearly ½ oz. of the hydrated bromide, loaned to a hospital by the British government, is kept in a lead case weighing more than a ton, inside a safe. It is estimated that 1 part in 1,000,000 of the emanations penetrate the thick lead sheath.

MAJORCA, MEDITERRANEAN ISLE, IS IDYLLIC GARDEN SPOT

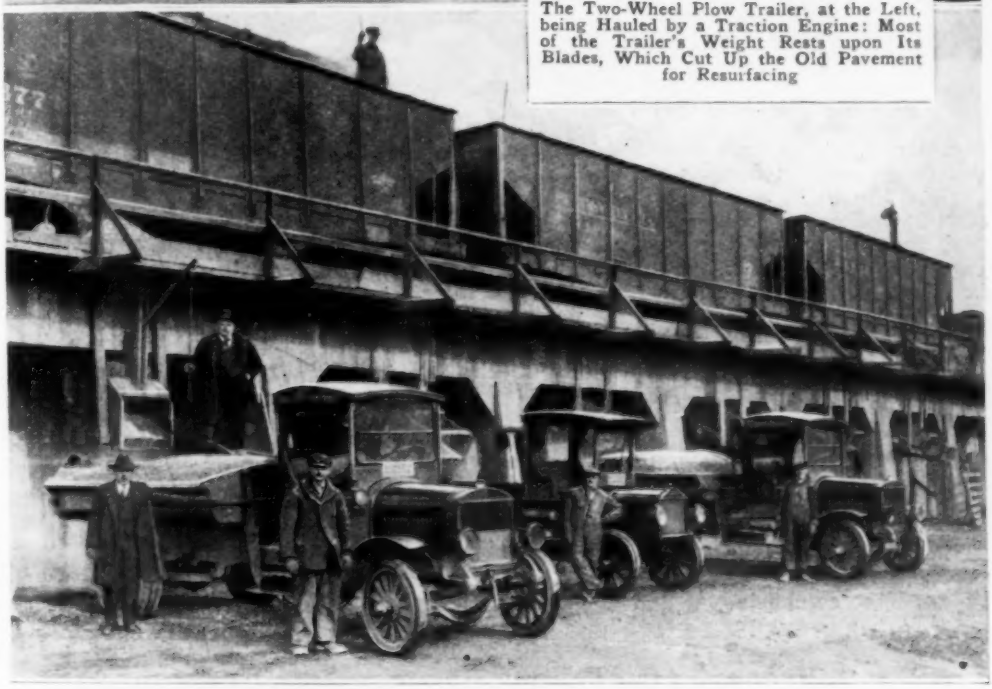
No writer of fiction could escape criticism for picturing in this day a land so incredible as to include marvelous scenic beauty, ideal climate, low cost of living, and a people honest, peaceable, and charming, who go about their business and enjoy their lives with most unmodern calm and leisure. That there actually is just such a place, however, where these characteristics are so conspicuous as to set the region apart from the rest of the civilized world, is revealed by travelers who have "rediscovered" the island of Majorca, in the Mediterranean Sea. This, labeled by observers the most enchanting of all the Mediterranean isles, is the largest of the Balearic group, belonging to Spain and only 10 hours by steamer from the mainland. Its scenery is a blending of flat, cultivated lands, occupied by orchards of lemon, orange, almond, and olive trees, and huge frowning cliffs running up to peaks 4,000 to 5,000 ft. high, with little villages hung upon their sides. Despite its bland tranquillity, the island has managed to acquire 120 miles of railroad, and a good system of highways. As illustrating the community's financial modesty, it is stated that monthly dues to the fashionable Royal Club of Regattas, at last reports, were about 20 cents.

A TURRET TOOLPOST FOR SCREW LATHES

For attachment to ordinary screw-cutting lathes an inventor has developed a turret toolpost. The turning and facing cutters are adjustable for height as they become worn, and thus it is possible to keep the cutting edge on center without the sacrifice of rigidity. A single movement of the binding lever releases and accurately indexes the next tool position, and rigidly clamps the turret.

A Turret-Toolpost Attachment for Converting a Screw-Cutting Lathe into One of the Turret Variety

The Two-Wheel Plow Trailer, at the Left, being Hauled by a Traction Engine: Most of the Trailer's Weight Rests upon Its Blades, Which Cut Up the Old Pavement for Resurfacing



The Fleet of Modern Motor Trucks Used by the County Highway Department for Hauling Road-Building Materials, Which are Received by Chutes from the Dump Cars Overhead, and Quickly Distributed

MODERN ROAD BUREAU MOTORIZES ITS EQUIPMENT

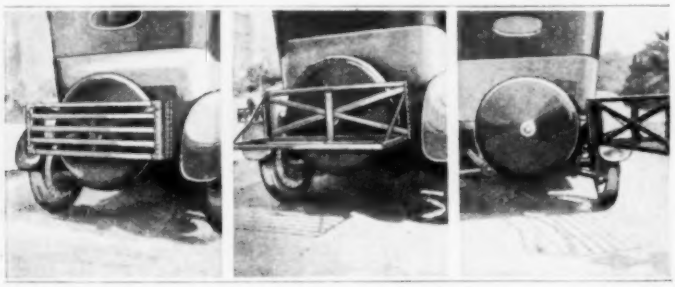
Road making and road repair are regarded as a serious business in at least one Indiana county. The equipment of the highway department has now been completely motorized, and all hauling of road-building material is done by a fleet of powerful modern trucks, that receive their loads directly from dump cars on an elevated switch track, and distribute them along the highways according to a definite system. When a road is to be broken up prior to resurfacing, a curious two-wheel trailer of heavy iron is brought into use. As this is hauled by a traction engine, most of its weight rests upon its plow blades, which cut away the old pavement quickly and effectively.

EXTENSIVE SEED COLLECTION FOR REFORESTATION

Extensive reforestation on the waste lands of Pennsylvania this year calls for the largest amount of seeds ever used. The seeds will be used for forest trees, municipal planting, and educational purposes. Seed not planted next spring will be held for planting the following year.

FOLDING TRUNK RACK ON AUTO OPENS TO FREE SPARE TIRE

A folding trunk rack that acts as a guard for the spare tire or wheel carried on the back of an automobile, has been invented by a western motorist. When the rack is not in use, its shelf folds up against the back, giving the effect of a steel-barred gate locked across the spare tire, and protecting it from theft or injury. When it is necessary to remove the tire, however, the folded rack, hinged at one side, is easily swung out of the way.



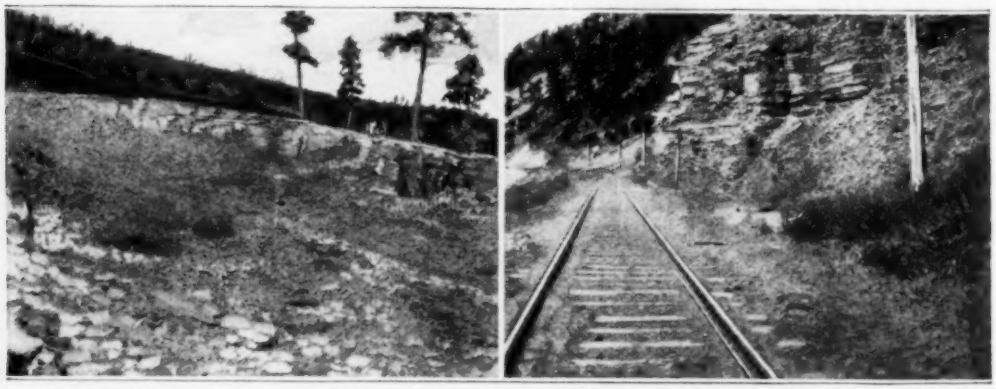
Left: The Trunk Rack Folded over the Spare Wheel like a Gate. Center: The Shelf Lowered Ready to Receive a Trunk. Right: The Whole Rack Swung Open to Give Access to the Spare Wheel

SOUTH DAKOTA TO OPERATE HUGE CEMENT PLANT

State-owned enterprises of one kind or another are not uncommon, even in this land of private opportunity, but few of them can be classed as industrial, at least in the manufacturing sense. Distinctly unusual, therefore, is the new undertaking of the state of South Dakota—the establishment and operation of a Portland-cement plant of huge capacity, based on natural resources of almost limitless extent. For this development the sum of $1,000,000 already has been appropriated, together with an additional $25,000 for prospecting expenses, and another appropriation of $500,000 is now under consideration for the installation of machinery.

Though extensive chalk and shale deposits exist in the eastern part of the state, it is practically assured that the location of the new plant will be determined by the vast beds of limestone underlying the famous Black Hills district. This formation, lying within an oval area, 160 miles long and 125 wide, contains gray, purple, and pale pinkish-buff limestone in all thicknesses up to 500 ft., and huge banks of shale as thick as 200 ft. are easily accessible.

Blasting with black powder will be the method employed in quarrying both limestone and shale, using machine shovels to remove the product. For the intended output of 750 bbl. of cement a day, 240 tons of the raw material will be needed. Using electric power with a connected load of 1,000 hp., and producing 22,500 bbl. a month, at 14.4 kw.-hr. per barrel, the monthly consumption of current will reach 324,000 kw.-hr. This large amount already is available from two lines running but a short distance from the proposed site. The low figure per barrel is made possible by the use of gravity in handling the materials. The ultimate capacity of the plant is to be 2,000 bbl. a day, or 400 tons, involving an expenditure of $400,000 a year, and employment of 400 workers.



Left: A Typical Outcropping of Limestone in the Black Hills District of South Dakota, Where Seams Up to 500 Feet Thick Are Available. Right: The Edge of a Shale Bank Lying alongside the Railroad

Instead of Defacing the Landscape with a Billboard, a Building Contractor Utilized the Front of His Lumber Warehouse for Building Propaganda

LUMBER-SHED FRONT UTILIZED FOR BUILDING PROPAGANDA

In place of the usual unsightly billboard and the equally monotonous vista of a lumber warehouse, the owner of a lumberyard utilized the space on the front of his shed for building propaganda. The entire front of the building was covered with a sign which shows a picture of one of several styles of houses, in the building of which the owner specializes. The entrances to the warehouse are closed by sliding doors which have painted on them pictures of a fountain and arbor seat.

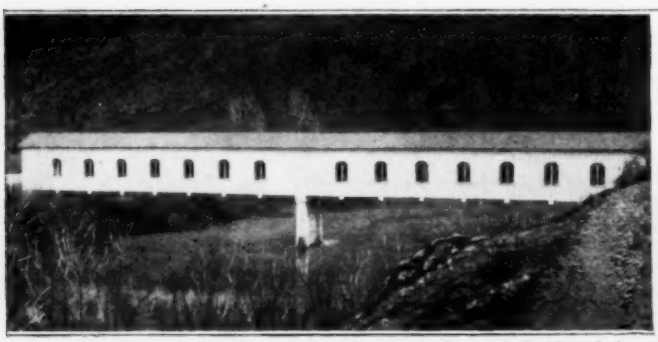
SOLID AND PNEUMATIC TIRES USED ON NEW TRUCK WHEEL

The efficiency of the solid tire and the shock-absorbing qualities of the pneumatic are combined in a new motor-truck wheel of recent development. The penumatic tire is mounted between the hub and the rim, and the solid one, which gives traction and reduces noise, in the usual way on the rim. Due to the arrangement of peculiar "bearing spokes" between the rim and the pneumatic tire, the latter shares in absorbing road shocks.

LIFE JACKET OF "LUSITANIA" FOUND IN DELAWARE RIVER

Thought to have traveled more than 15,000 miles in the five years that have elapsed since the torpedoing of the liner "Lusitania" off the Irish coast in 1915, a slime-covered life jacket bearing the name of the ill-starred vessel was recently taken from the Delaware River near Philadelphia. One of the shoulder straps is cleanly severed as though cut by a knife, and visualizing the sinking of the vessel, it is surmised that several of the jackets became entangled and that some fear-crazed person slashed the strap that held them fast. The name of the vessel in black is still clearly legible.

In memory of Dr. John B. Murphy, the eminent Chicago surgeon, a memorial building is proposed on a site given by citizens of Chicago and accepted by the regents of the American College of Surgeons. The building will be devoted to conferences, meetings, and the maintenance of a pantheon of American medicine and surgery.



The Illustration Above Shows the Type of Covered Bridge being Built in Oregon from Timber Which Is Plentiful and Close at Hand. Right: View Looking through the Bridge Showing the System of Timbering and the Illumination Provided by the Windows

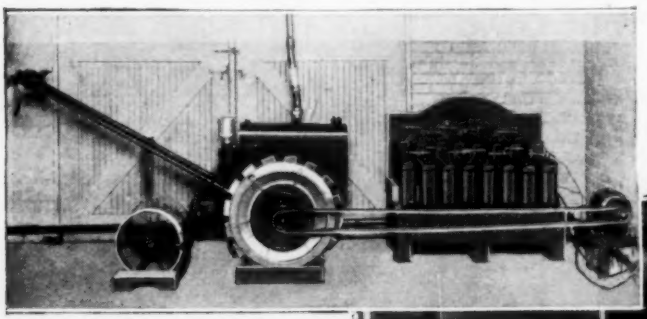
COVERED TIMBER BRIDGES FOR OREGON'S HIGHWAYS

As the material is plentiful and close at hand, and because the initial cost and expense of maintenance is low enough to make them acceptable, the Oregon Highway Commission is building several covered timber bridges. Observation of existing structures of this type is the source of claims that the average life of uncovered bridges is from 10 to 15 years and that proper covering of a wooden truss span adds about 50 per cent to the life of the bridge. The insufficiency of light that has always characterized bridges of this type is overcome by cased window openings of pleasing design.

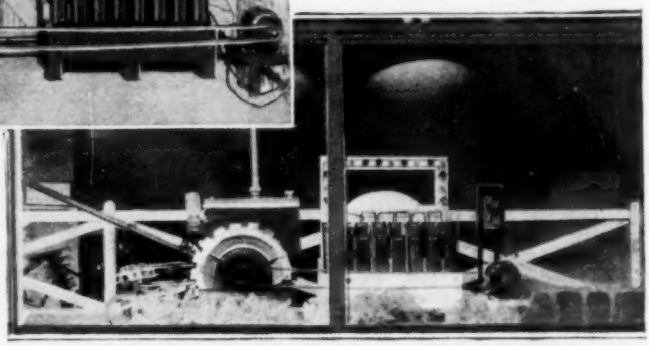
¶An interesting system of remote control, recently installed at its screen station by one coke plant, makes it possible for the motorman of the electric locomotive to abandon his train temporarily after he has spotted the first car under the loading chutes. Then the operator of the screen station moves the train forward car by car, until the loading is completed.

FARM-LIGHTING SET DRIVEN BY SMALL TRACTOR

All sorts of odd jobs besides field work are required of the modern farm tractor, and now even the small, plowlike walking type of tractor, with its little 3-hp. engine, is given other duties. Auxiliary equipment just put on the market makes it possible for this machine to do all the farm lighting. A small generator is belted to the free power pulley at the side of the tractor's ground wheel, and connected to a set of 16 storage cells through an automatic charge regulator. Lighting current may be taken from the battery when the engine is not running, or from the generator, or both, when it is, giving an ample supply for all ordinary purposes.



The Walking-Type Tractor Belted to the Generator



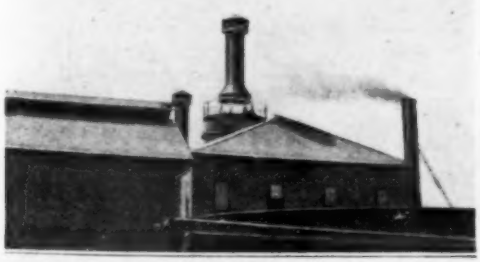
The Complete Outfit on Display, with a Small Instrument Board behind the Generator, and the Battery Running a Bank of Lights

NEW TWO-CYCLE MARINE ENGINE OF DIESEL TYPE

The completion and successful test of a new two-cycle marine engine of the Diesel type has recently been announced. This type, which is an internal-combustion heavy-oil engine, produces the same horsepower as a four-cycle engine practically twice its size. At the same time it effects a saving of two-thirds in fuel costs as compared with the oil-fired steam engine, and shows a much greater degree of economy than any other Diesel engine on record. It is adapted to land use and cargo ships of any size. The vessel equipped with it is a greater advance over the oil-burning steamship than the latter is over a coal-fired steamer. This new engine is of American design and construction, and is especially adapted to American operating conditions on land and sea.

DISCONNECTED CHIMNEY IS AN INNOVATION IN STACKS

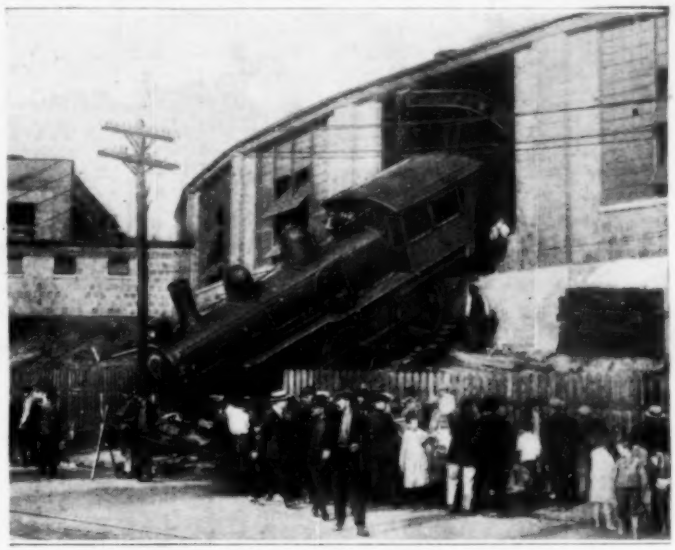
Apparently connecting with nothing, the strange smokestack of a western oil refinery, attracts considerable attention and comment. In reality the opening in the bottom of the stack is lined up with a similar aperture in the factory, and the rush of smoke is so rapid as to force it through the chimney. The open space at the bottom is provided to increase the draft.



To Obtain Increased Draft the Stack of a Western Oil Refinery was Built with an Opening at the Bottom

LOCOMOTIVE PLUNGES THROUGH WALL OF ROUNDHOUSE

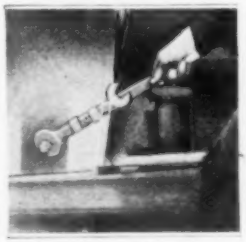
Run into the roundhouse of an eastern railroad, where it was deserted by its crew and neglected by the hostlers, a temperamental locomotive ran away from the old homestead. The engine got a flying start and, plunging through the wall of the roundhouse, landed on its nose in a sandbank several feet below the level of the floor, stopping on the edge of the sidewalk below.



Plunging through the Wall of the Roundhouse, in Which It had been Left by Its Crew, This Temperamental Locomotive was Brought to a Stop at the Edge of the Pavement

AUXILIARY WRENCH HANDLE INCREASES LEVERAGE

A handle for increasing the length of an open-end wrench, to furnish the additional leverage demanded for loosening a "frozen" nut, has made its appearance. The extension handle is slipped over the end of the wrench, and the additional leverage is obtained without unnecessary strain on the wrench. The device is made in several styles, one model of which is provided with a screwdriver end. The new device is made in a number of different sizes to fit both large and small wrenches.



INSTRUMENT MEASURES LIGHT REFLECTED BY ROOM WALLS

Diffused light reflected from walls, furnishings, and other miscellaneous objects, an important but hitherto indeterminate element in calculating illumination, now may be accurately measured with a simple instrument. The device, developed at the Bureau of Standards, consists of a portable hollow sphere, about 8 in. in diameter, painted white on the inside. An opening in one side of this ball is placed against the surface to be tested, a small electric light is inserted through another opening, and observations are taken through a third hole by means of a photometer. Two separate observations are made, under differing conditions, and a direct reflection figure obtained.

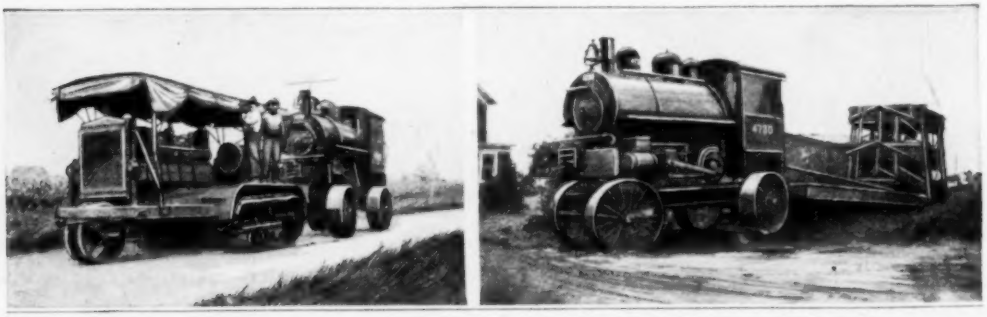
HAUL LOCOMOTIVES OVERLAND ON SPECIAL WAGON

Desiring to use locomotives on large excavating jobs where there are no tracks to take them, a busy contractor in the Northwest has built a special wagon for transporting the big engines overland. The wagon, built of steel, has a pair of standard rails running from end to end of its bed. The locomotive, arriving on a flat car, is jacked up so rails can be placed under it, the wagon is backed against it, and a 120-hp. tractor pulls the engine onto it, with block and tackle applied at the other end to snub its momentum. The same tractor then hauls the wagon and its queer load to the work site. There one end of the wagon is lowered by digging under the wheels, and with the tractor's aid the locomotive is slowly backed off onto the ground rails prepared for its reception.

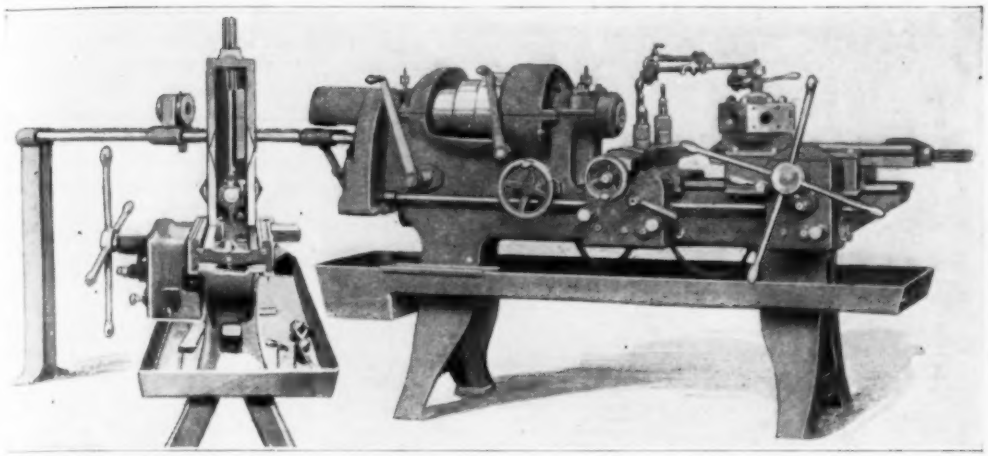
THERMOMETER DIAL LEGIBLE AT LONG DISTANCE

Because of the large size and marking of its dial, a thermometer recently placed on the market by an eastern firm can be read at a distance of 20 or 30 ft., according to the manufacturers. White graduations and figures on a black background are used, and the indicating hand is white. All parts of the device are metal, excepting the dial face cover, which is glass. It is possible to place the dial as much as 300 ft. away from the heat-sensitive bulb which operates the mechanism, by connecting the two with a flexible metal tube filled with the same fluid as the bulb. The instrument is made in several sizes, suitable for different installations.

¶A new source of gum, obtained from the candlewood of Arizona, is stated to have all the properties of rubber and to vulcanize properly. A ton of raw material yields about 200 lb. of gum and 90 lb. of a tarry by-product, which is also valuable.



Left: The Locomotive, on Its Special Wagon, being Hauled along the Road by a 120-Horsepower Tractor. Right: Pulling the Locomotive from the Flat Car onto the Rails of the Steel Wagon



BY COURTESY OF THE IRON AGE

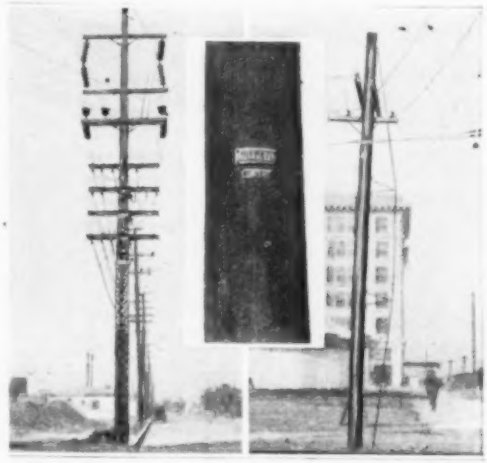
One of the New Screw Machines, of 1⅛-Inch Capacity, Equipped with Gear Friction Head and Power Feed for the Turret and Cut-Off. The Turret Slide and Saddle are Seen in Detail at the Left

NEW SCREW MACHINES EMBODY SEVERAL IMPROVEMENTS

A new type of screw machine, the product of an Indiana concern and made in five sizes, from 7/16 to 2 9/16-in. capacity, is interesting in that it combines in one the desirable features previously scattered among several machines. Its most notable characteristic is that its parts are standard and interchangeable, allowing different combinations of units to suit specific needs without altering the design. Lever, hand-screw, or power feed may be installed as desired. The spring-collet chuck is operated by a fork lever, instead of the usual sliding fork, and the bar of stock is fed forward by the motion of the automatic chuck lever through a system of connecting links. A number of other improvements and refinements are embodied in the new machines, which are built with sufficient rigidity and power not only to meet all present demands of modern high-speed steel, but to allow a considerable margin for future developments in cutting metals.

POWER COMPANY USES TRUSSED AND COMBINATION POLES

The people of one American city have been interested lately in the work of the company which supplies the city with electricity. This activity has been concerned with the poles which support the various distribution lines. Many of the old-fashioned all-wood poles have been replaced, first, by combination poles consisting of latticed ironwork topped by short lengths of wood. Poles of this kind combine the merits of permanence and good insulation. Many poles have been trussed, second, when located at street corners and other spots where guying was advisable but impossible. This trussing provides counterstrain without endangering traffic. The wooden poles have



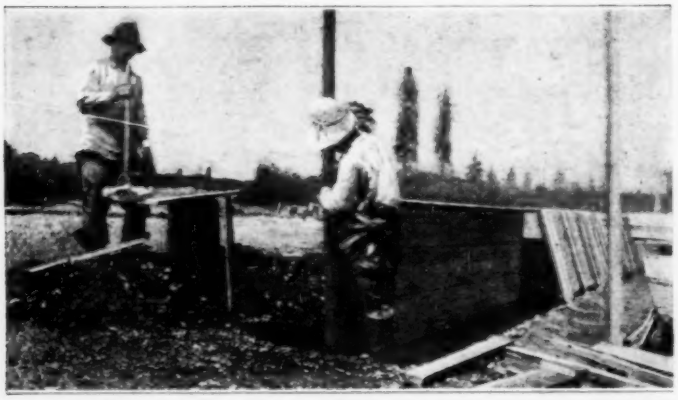
One of the Combination Iron and Wood Poles is Seen at the Left. At the Right Is a Pole Which has been Strengthened by the Addition of a Truss. Inset Is a Pole with Two of the Identification Plates

been identified as company property, finally, by small plates of tin on which are embossed the initials of the company.

¶ Figures reported for the first year of civil flying in England reveal a total air mileage of 734,200, made in 38,954 flights, carrying 70,000 passengers with but one fatal accident. Machines numbering 519 were registered.

CONCRETE DIKES USED IN OYSTER CULTURE

BY CLEVELAND GAINES



The Forms for the Concrete Dikes, Protecting the Oyster Beds, are Erected on the Sea Bottom When the Tide Is Out

OYSTER culture has become an industry of considerable importance on Puget Sound. At its southern extremity, near Olympia, the capital of Washington, there are extensive beds which have been successfully operated for many years and which are being enlarged as rapidly as possible. Both the native, or "Olympia," oyster and the eastern oyster are successfully propagated in these waters. The Olympia oyster is highly prized for cocktails and similar special dishes of the banquet table. It is much smaller than the oysters of Chesapeake Bay and other eastern beds.

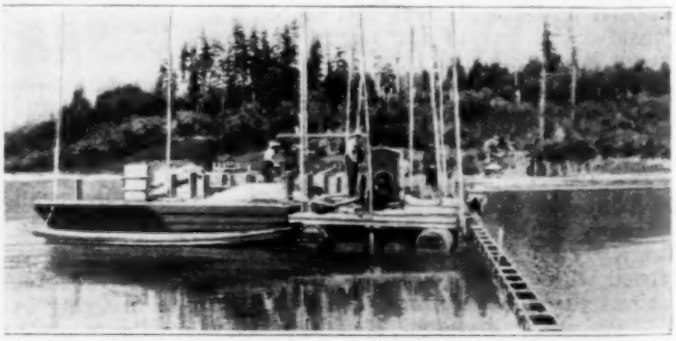
The oyster beds on Puget Sound are located in comparatively shallow water. On account of the great range of ocean tides in this territory, the beds are exposed during periods of extreme low tides. As these occur at night during the winter and during the day in the summer, the oysters are subject to injury from the heat of the sun at extreme low tides in the latter season, and from freezing during the winter.

While the winter climate of western Washington is not severe, there is often sufficient frost to kill the oysters unless protective measures are adopted. The oyster beds have at all times been kept covered with water by means of the so-called French "parking" system; that is, the sloping areas covered by the oyster beds are terraced and dikes provided which retain sufficient water as the tides recede.

The first dikes built on Puget Sound were made of planks fastened to stakes and filled with earth, the walls being about 1 ft. thick. But this form of construction was found to give only one year's service, because crawfish bored under the wooden walls, permitting the water to escape, and the teredo rapidly destroyed the timber. Logging operations and floating driftwood also damaged these makeshift dikes frequently, so this temporary construction was abandoned and the dikes were built of concrete. Some of these concrete dikes have now been in service for many years and are as effective as the day they were completed.

Once the Forms are Built, the Concrete is Quickly Poured, and the Top of the Dike Leveled Off with a Trowel

The concrete dikes



The Concrete Mixer is Carried on a Scow, from Which the Prepared Concrete is Poured Directly into the Forms Seen at the Right. By This Method the Dikes are Constructed Quite Rapidly, and When Set Are Practically Indestructible

are from 1 to 4 ft. in height, usually 9 in. in width at the top, with one face vertical and the other sloped about 1 in. to the foot of height. The concrete mixer is mounted on a small barge or raft, and the materials are towed on scows to the mixer. Wooden forms are built at low tide and are left in place after the concrete is poured. In most cases a 1:7 mixture is used, and vertical steel reinforcing rods are placed in the concrete.

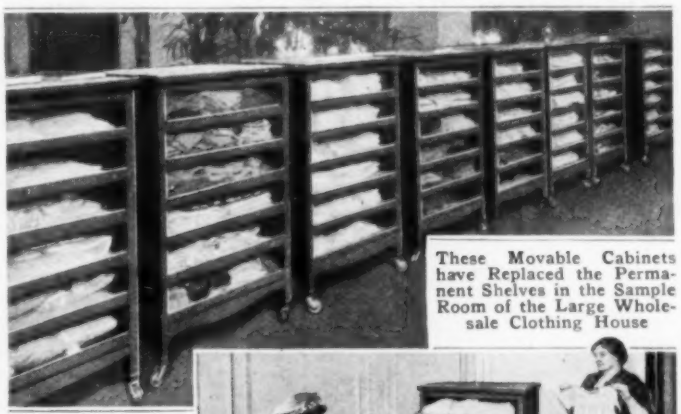
The diked areas are of irregular shape, conforming to the contour of the tideflats. In every bed there are a great many small diked areas ranging in size from two to six acres. Some of the larger beds, composed of many smaller units, aggregate 60 acres.

As a matter of crop insurance, the concrete dikes have proved a profitable investment. During the unusually severe winter of 1919, approximately half of the oyster beds were not protected by the diking system, and the crop was killed by the low temperature. The oysters in the diked areas were not harmed. Besides, the first cost of the concrete dike is not high, and practically no maintenance expense is involved, since it appears to be unaffected by the salty or brackish water of the oyster beds and resists perfectly the destructive action of floating logs and other débris thrown against it by the tidal currents.

The Oyster Bed Seen Uncovered in the Foreground and Center has been Well Served for Years by the Concrete Dike at the Left

MOVABLE CABINETS BASIS OF NEW SELLING PLAN

As an accommodation to visiting buyers, a large wholesale infants'-wear establishment in Chicago, Ill., has lately substituted for the permanent shelves in its sample room numerous movable cabinets. Each of these contains six wide drawers, is fitted with hinged wing boards on the sides, and rolls quietly on four rubber-tired casters. Formerly the buyer was often compelled to walk tiresomely from one display case to another; but since the installation of the "à la carte" system, as punning employes have dubbed it, she is simply ushered to an easy-chair in an airy, parlorlike buying room. A moment after she has announced her wants a saleslady wheels into the room a cabinet containing the desired samples. It is plain that the system might with advantage be adapted to other commodities as well.



These Movable Cabinets have Replaced the Permanent Shelves in the Sample Room of the Large Wholesale Clothing House

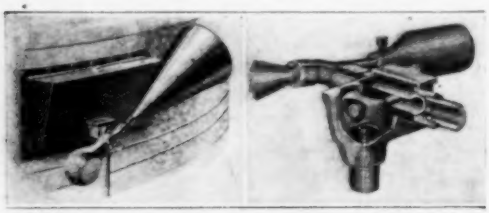
Instead of Walking from One Display Case to Another, the Visiting Buyer Seats Herself Comfortably in a Parlorlike Display Room and Makes Her Selections from the Stock, Wheeled In on the Shelves of the Movable Cabinets

SODA AND POTASH KETTLES HEATED BY GAS

Steam-heated soda and potash kettles have long been used in the larger factories and shops for cleaning grease, dirt, and chips from screws, nuts, gears, and similar parts, in preparation for hardening, plating, assembling, or repairing them. Installation of these kettles in smaller establishments, which ordinarily use gasoline for this work, is now made possible, however, by the introduction of a gas-heated apparatus. This consists of a barrellike frame with a circular gas burner in the bottom, a removable pot, and a metal basket into which the articles are placed for immersion.

PECULIAR VALVE KEEPS WATER IN FURNACE HUMIDIFIER PAN

For maintaining constant water level in the humidifier pan of the hot-air furnace there is now made a valve of interesting action. It is controlled by a double rocker arm, at one end of which is a cast-iron weight, at the other a conical water tank. The port between tank and humidifier pan is always open. As the water rises in the pan, it backs up into the conical tank until the tank outweighs the iron weight, when the tank falls, and the flow of water to the pan is stopped. Similarly, as the water evaporates from the pan, the conical tank slowly grows lighter than the weight, until it rises, and so allows the water to flow in from the city main. To close the valve for the summer it is necessary simply to remove the weight from the rocker arm.



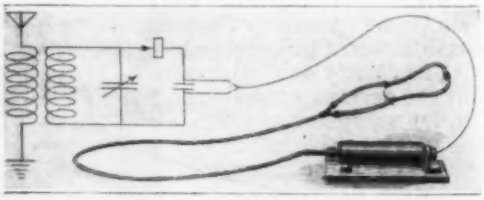
The Valve is Seen at the Left as Installed beside the Humidifier Pan of the Hot-Air Furnace. At the Right Is a Cutaway View

ALUMINUM AUTO PISTONS WORK WITH VARYING CLEARANCE

Special aluminum pistons, now fitted as standard equipment in a popular make of eight-cylinder auto, proved themselves, in recent tests, capable of meeting unusual conditions of interchangeability and varying clearance. Three new stock cars were tested briefly for acceleration and speed, and their 24 pistons were then removed, mixed up together, and replaced at random. As a result, the clearances varied from .001 to .00575 in., some pistons being tight and others quite loose. In spite of this condition, tests with the reassembled cars showed only slight variations from the original records of acceleration and speed, and no symptoms were developed either of piston slap with the loose pistons, or of sticking of the tight ones.

TELESCOPING CYLINDER KILLS "STATIC" NOISES IN WIRELESS

For eliminating the rumbling, scratching noises which under the name of "static disturbances" have long inconvenienced the wireless operator, there is now made a simple, nonelectrical machine. It consists of a telescoping, airtight cylinder, at one end of which is the receiver, at the other a tube which connects with the earpieces of a stethoscope. As the tones of the "static" differ in pitch from those of the signals, the operator simply adjusts the cylinder until the contained air is in resonance with the latter. In this way the foreign noises are cut out, and the radio signals come through without interference.



The Metal Cylinder at the Right is Telescoped Until It Is in Resonance with the Radio Signals. Thus the "Static" Noises are Cut Out

The Apparatus Mounted on the Special Plow at the Right of the Tractor Measures and Records on a Revolving Drum Drawbar Pull, Slippage of the Wheels, and the Depths of the Furrows Made. The General Purpose Is to Test the Machines under Actual Working Conditions

APPARATUS RECORDS WORK OF TRACTOR AND PLOW

Mounted on a special plow, an apparatus of recent development measures and records the detailed performance as the plow is drawn across the field by a tractor. To measure the pull of the tractor, first of all, an oil cylinder is used at one end of the drawbar, and is connected by an armored tube to the pencil on the recording drum. On this drum, revolved by means of a small trailing wheel, the time intervals are marked by clockwork. To reveal slippage, further, two pencils record the number of revolutions made by the rear wheels of the tractor. The depths of the furrows are recorded, finally, by means of curved steel rods which drag in the furrows and actuate two more pencils.

EGGS PRESERVED FOR WEEKS BY ARTIFICIAL SHELL

Preserving eggs by giving them an extra, artificial shell is the method used by a Michigan inventor, who has compounded a liquid which dries on the egg in a hard, air-tight coating. After the eggs are dipped and dried, which takes but a short time, they are much less readily broken, and, if strictly fresh when treated, are preserved for a number of weeks without deterioration. They may be kept still longer in cold weather by immersing them in water, which dissolves the coating and forms a preservative solution. From one to two hours' immersion is required to remove the false shell.

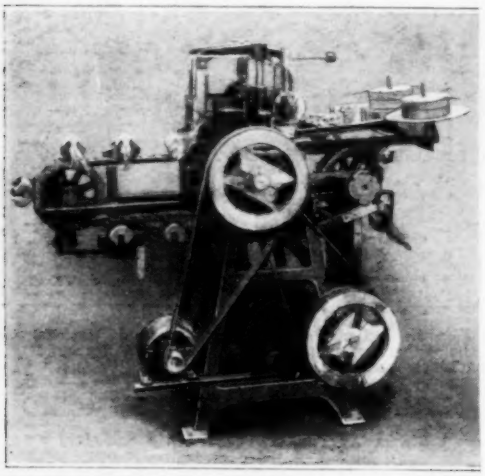
CRANE ON WAGON BED USED TO ICE RAILROAD CARS

Though it is a simple affair, consisting only of two shear legs pivoted to the bed of a wagon, a small crane is now proving itself invaluable in one of the Minneapolis railroad yards for the work of hoisting ice from the wagons to the tops of refrigerator cars. Its chief merit, naturally, is its portability. One horse pulls it easily into position; then is led out from the shafts and hitched to one end of the hoisting cable.

This Simple Apparatus is Used for Lifting Ice from the Wagons to the Tops of Refrigerator Cars. It is Moved and Powered by One Horse

MEXICAN HOT TAMALES NOW MADE BY MACHINE

Those who in the past have suppressed a desire for Mexican hot tamales because of suspicions regarding the conditions of



This Electrically Operated Machine Turns Out the Famous Mexican Hot Tamale at the Rate of 100 a Minute

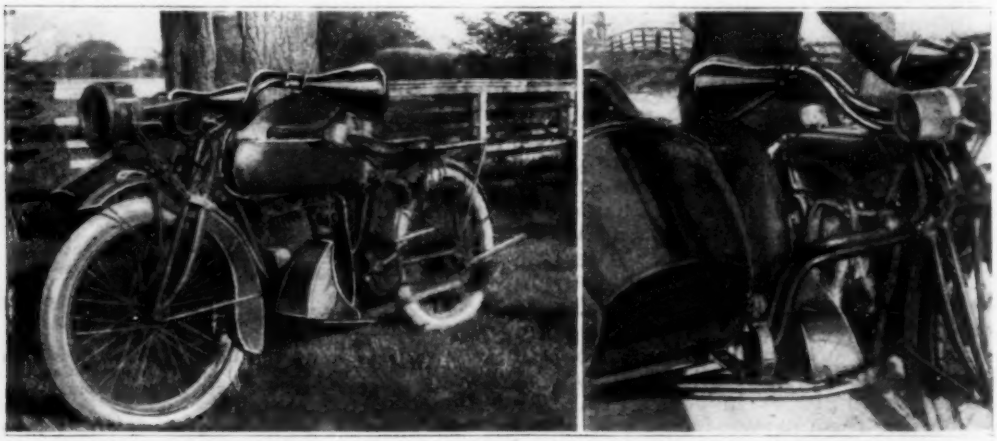
manufacture will be pleased to know that the fiery dish can now be made by machine. The wrappers, spiced meat, cooked cornmeal, and other ingredients, are fed into various hoppers, and then are compounded, rolled, tied, and finally fall off the conveyor belt at the rate of 100 a minute. As the skilled tamale maker seldom turns out more than one a minute, it is apparent that the product of the factory is to be known hereafter for its bulk as well as for its cleanliness.

CRATERS MADE BY AIR BOMBS RESEMBLE RINGS ON MOON

That the ringlike craters that mark the moon's surface, familiar to all through many published photographs, were formed by gigantic explosions, seems to be indicated by the results of certain war-time experiments. Bombs dropped from airplanes on a certain eastern field left markings which, photographed, bore a striking resemblance to the lunar craters and peaks. The explanation advanced is that meteoric bodies striking the moon at speeds of 10 to 40 miles a second, unretarded by any atmosphere, developed an impact temperature of something like 27,000° F., turning everything at the contact point into a gas, whose sudden outrush had all the characteristics of a huge bomb explosion.

CYCLIST'S HANDS AND FEET WARMED BY EXHAUST GASES

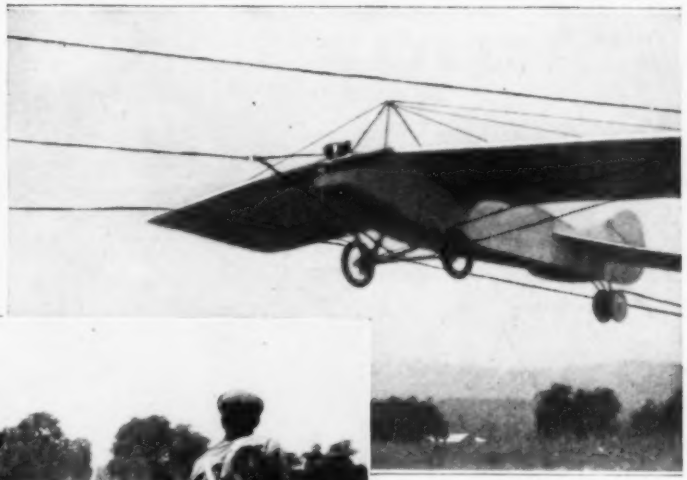
Thanks to a recent invention of a motorcycle-heating system, the owners of these two-wheeled machines may now warm themselves in winter, like the owners of the most luxurious limousines, by utilizing the exhaust gases of the engine. This is done by leading the gases through flexible pipes to metal cowls on handlebars and footrests. On the first, these cowls resemble small megaphones; on the footrests they are not unlike the leather shields fitted to the cowboy's stirrups. Even without the warming of the gases these cowls are a wintertime convenience, as they protect hands and feet from the numbing rush of the air.



Flexible Pipes Lead from the Exhaust Manifold to Cowls on Handlebars and Footrests, as Seen in the Side View at the Left and the Close-Up at the Right. This Arrangement Keeps the Driver's Hands and Feet Warm on the Coldest Day

CAPTIVE AMUSEMENT PLANE FLIES WITHOUT PILOT

Genuine airplane flights within the confines of an ordinary amusement park are made available to pleasure seekers by a recent California invention, which dispenses altogether with a pilot, and insures complete safety for the passengers. The course of the flight, which may be from 1,000 ft. to a quarter mile or more, is marked by a pair of slack cables, anchored to the ground at each end. Rings on the airplane wings encircle the cables and are so arranged that the plane is kept horizontal at all times. The motive power is a third cable, attached to the plane and wound on a drum at the end of the course, driven by a 50-hp. electric motor. When the power is applied, the plane gains speed until it rises in the usual manner, taking up the slack of the anchored cables, but confined by them to a height that thrills its passengers without frightening them.

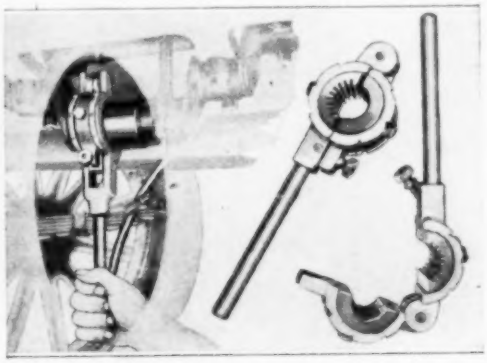


The Captive Plane in Full Flight, Drawn Along by the Center Cable and Guided and Confined by the Side Cables, Which Pass through Rings on the Wings

The Operators Controlling the Electric Motor and Winding Drum as the Captive Airplane, Drawn by the Cable, Nears the End of Its Flight

CRANKSHAFT TRUED BY SIMPLE TOOL WITHOUT REMOVAL

The garageman who has trued up crankshafts heretofore on an expensive grinding machine will be surprised to learn that by means of a new tool this work can now often be done without removing the shaft from the car. The tool consists of a semicircular cutter and a like-shaped grinder which are fitted into a hinged frame in order that they may be clamped about the crankpin. A handle is screwed into one member of the frame to make manipulation of the tool easy. As the cutter removes the high spots on the pin, the nut of the clamping screw is turned to maintain contact.



The Tool is Shown Open and Closed, at the Right, and at the Left, as Used in Truing Up a Shaft. The Cutting Side of the Tool Removes High Spots and the Other Side Smoothes the Shaft

CANADIAN WHISKY SHIPPED IN PIG CARCASSES

Canada is no oasis in the American Sahara and illicit liquor trafficking is being developed into a fine art. All manner of

Another Bootlegger's Trick Discovered: A Large Consignment of Liquor Concealed in Pig Carcasses Confiscated by Canadian Officials

clever dodges are resorted to by the whisky runners, possibly one of the most original being the shipment of a large consignment of liquor packed in the carcasses of pigs. The liquor was discovered by officers as the "pork" was being unloaded from the freight cars. Needless to say it was confiscated by the officials.

DISTINCTNESS OF SOUNDS AS HEARD BY TELEPHONE

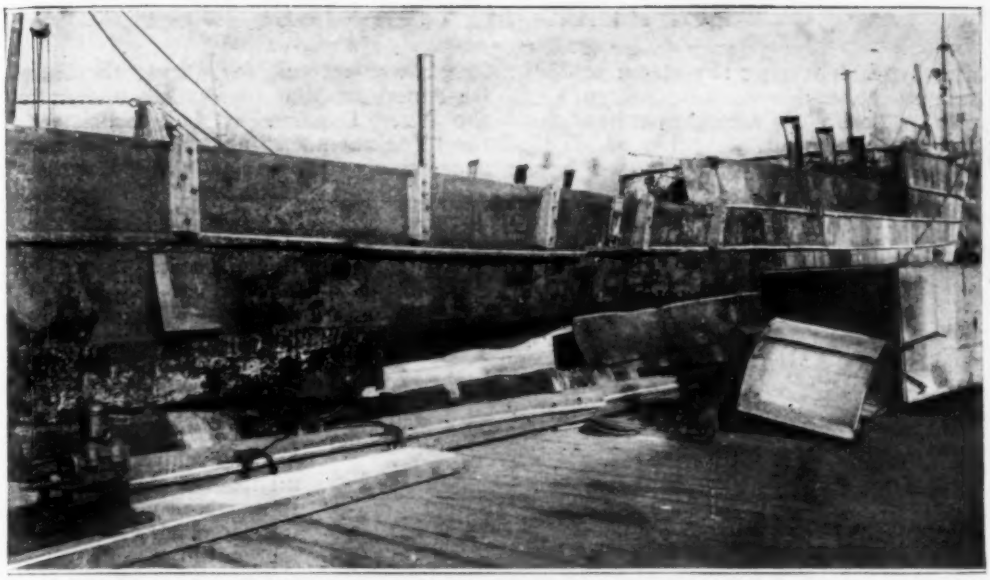
An extended and comprehensive research on the ability of the human ear to recognize sounds heard over the telephone has just been completed, and the results were reported at a recent meeting of the American Physical Society, in Washington, D. C. It appears that, at all intensities, the sounds of "th," "f," and "v" are consistently the most difficult to understand, and, at weak volumes, the "z," "h," and "s" are heard with great uncertainty. As a rule, the consonants are harder to recognize than the vowels, but there are notable exceptions in the case of the consonants "l," "r," and "ng," which are among the very easiest sounds to hear correctly, while the vowel "e," as in "ten," is among the most difficult. The sounds "i," "ou," and the vowel sound in the word "talk" are missed less than once in ten times, even with very weak intensities.

NEW INDOOR GAME PLAYED WITH BAG ON END OF ROPE

An indoor athletic game of recent invention demands of the contestants considerable quickness of muscle and eye, yet can be played in a small room without damage to furniture or windows. The apparatus which makes this possible consists of a pipe standard, about five feet high, which is mounted on an ordinary table, and from the upper end of which hangs a shorter length of rope, with a pear-shaped punching bag fastened to its free end.

In order to play the game, the contestants strike the ball with the hand, those on one side of the table attempting to wind the rope around the pipe in one direction, those on the other side striving to do the opposite. By lengthening or shortening the rope the players can adapt the apparatus to the size of the crowd desiring to play.

Two Players are Demonstrating the New Indoor Athletic Game, at the Right. The Apparatus Consists of a Pipe Standard, a Length of Rope, and a Pear-Shaped Punching Bag. The Standard Base is being Adjusted to the Table Top, at the Left



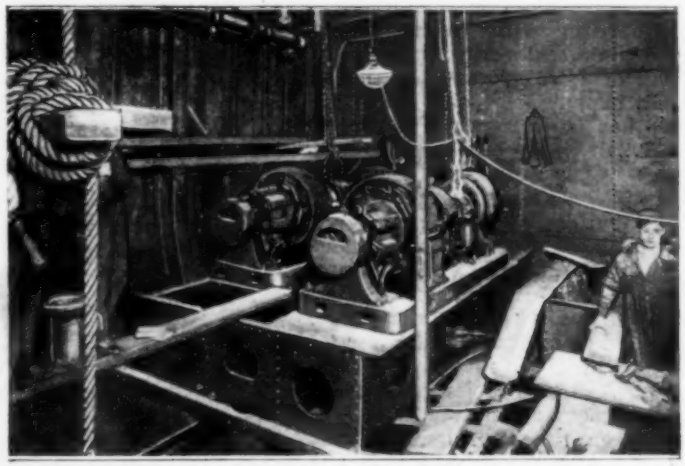
This Photograph of the First Electrically Propelled Merchant Ship was Taken Shortly after Its Resurrection from the Bottom of Chesapeake Bay, and Before It was Towed to Brooklyn, New York, for Installation of the New Power Plant. The Plates have been Removed, Above, from the Area Struck by the English Freighter

FIRST ELECTRICALLY PROPELLED MERCHANT SHIP

BY JOE L. MURPHY

ELECTRICAL propulsion for ocean-going steamships, first advocated and adopted by the United States Navy only two or three years ago, is now deemed practicable and economical, and here in the United States, the first electrically propelled passenger and merchant ship of the world is being fitted out.

This pioneer ship is the "Powhatan," but, upon its rechristening, it will be known as the "Cuba." Once lying at the bottom of Chesapeake Bay, where it was sent following a collision with an English freighter, this vessel's rehabilitation promises to be the most interesting in the annals of maritime affairs. It will be electrically driven, electrically lighted, and its winches electrically operated. Electricity will play the big part throughout the interior. Only its auxiliary pumps for fresh water, bilge, fire, etc., will remain the same as those in ordinary reciprocating-engine types of boats.



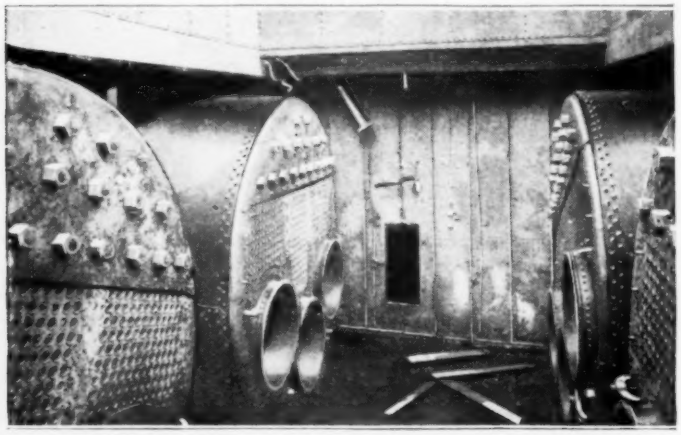
The Exciter Sets of the "Cuba's" Electrical Equipment are being Installed, Above. This and the Other Electrical Work was Done After the Ship had been Thoroughly Overhauled

Principal in the electrical apparatus which is being installed in the "Cuba" are, of course, the motor proper, turbo-generator, exciter sets, and electric-lighting set. The motor is of 3,000 hp., using current at 1,150 volts, and will run at 100 r.p.m. Its diameter is 14 ft. 2 in., and the over-all length, 9 ft. 2 in. The turbo-generator, of 3,150 hp., will run at 3,000 r.p.m., and will have separate exciting sets, by which speed and reversing operations may be controlled.

This generator will receive its steam from the main boiler of locomotive super-

heater type, delivering the steam at 250° F. superheat, and a working pressure of 190 lb. The boilers are oil-burning.

A main condenser, weighing 31,000 lb. and with an area of 7,000 sq. ft., will have an over-all length of 14 ft. 10 in. and a diameter of 6 ft. The electric-lighting set of 50 kw., at 125 volts, is 10 ft. 9 in. by 2 ft. 9 in. in dimensions. The main circulating pump is motor-driven, while the exciters, of which there are two, are to be turbine-driven, with an over-all length of 13 ft. by 3 ft. 6 inches.



This View of the Boiler Room Suggests the Condition of the Ship When It was Berthed at Norfolk, Virginia, after Six Months on the Bottom of the Bay

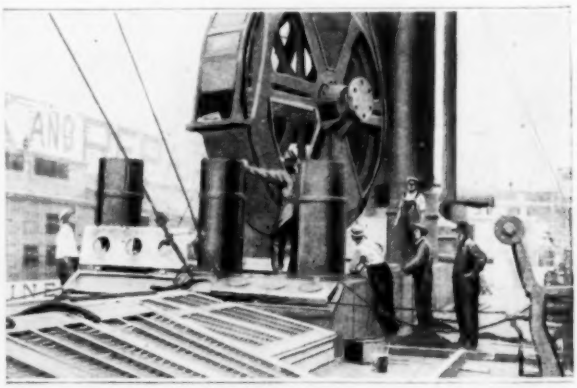
An idea of the size of the "Cuba" may help the reader better to understand that electric propulsion for ships has passed, or is about to pass, from the experimental stage. This ship is not a pigmy in comparison with ordinary ocean-going passenger and cargo ships. It is 300 ft. long, of 2,898 gross tons, and of 42-ft. beam.

It has had an eventful career. The sinking occurred about three years ago off Thimble Light, Va. It lay submerged for six months and was considered a total loss. But war made a demand for tonnage and the "Powhatan" was rescued from the waters of the Chesapeake. Berthed at Norfolk, Va., after its salvaging, it was towed to Brooklyn, N. Y., where its re-creation is being carried out.

At the time of the accident, the "Powhatan" was in the freight and passenger service between Norfolk and Boston. While its resurrection was not accomplished in time to permit it to take a part in the World War, it is, nevertheless, a war veteran, for during the Spanish-American War it was taken over by the Navy Department and rechristened the "Yorktown." Since then it has been successively known as the "Rawlins," "Resolute," "Yosemite," and the "Powhatan."

Now, the trials and the ultimate return to service of the S. S. "Cuba" will command the attention not only of the shipping world, but of those wizards of electricity who, in the small space of three years, have developed improvements in electrical designs which justify applying the electrical drive to mercantile vessels.

As to the operation of electrically driven vessels, the bugaboo as regards electricity is fast leaving the minds of the ship owners, who are coming to realize that, instead of introducing difficulties in the matter of operating force, the adoption of the electric drive will eliminate them and make ships considerably less dependent upon the skill and resourcefulness of crews. Convinced of the simplicity of large electrical apparatus as compared with small, the ship owner has also found that the machinery used to propel a ship electrically is in more than one respect less complicated than that which is used to light it. The motor itself embodies much of this simplicity. It would be equipped with a simple, slow-moving oil pump maintaining automatic lubrication in the motor compartment. A storage



The 45-Ton Motor Develops 3,000 Horsepower, Using Current at 1,150 Volts. The Diameter Is 14 Feet 2 Inches. It is being Lowered into the Hull, Above

tank with an emergency drip supply to the low-speed bearings is deemed practicable for lubrication purposes, and thus self-lubrication becomes quite safe as well as simple.

The success of the electrical drive is guaranteed. Electrically driven auxiliaries are to assure the reliability and practicability of the new service. Such auxiliary apparatus, it is claimed, will be less liable to interruption than any other form of single-screw equipment. Provisions are being made for the navigation of the ship at half speed even though the main generating unit be out of service. This would come through a motor-generator set or rotary converter, arranged so that the power of the auxiliary generating units be delivered to the main motor.

HAMMERS PIECES OF IRON INTO ARTIFICIAL ROSE

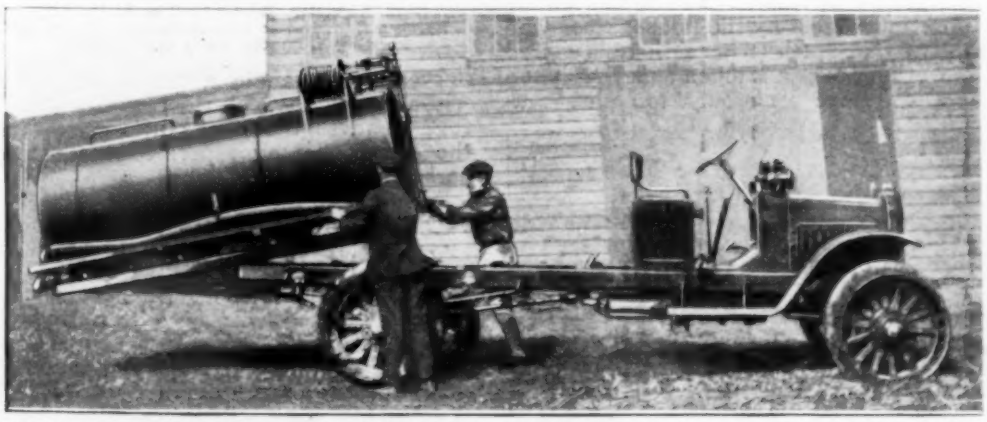
Working during his leisure hours with just a hammer and a few other simple tools, a workman in a steel plant at Moline, Ill., completed recently a beautiful job of iron forging. It takes the form of an American Beauty rose, complete with individual petals, long stem, and leaves. So painstaking is the craftsmanship that in the leaves and petals the texture of nature is faithfully reproduced.

CHURCH TO ATTRACT ALL EYES WITH HUGE ELECTRIC SIGN

Not to be outdone by worldly and frivolous competitors in the eternal effort to catch the wandering eye of man, a New York church is erecting an electric sign of enormous proportions and unusual attractiveness. Built at a cost of $3,000, the new sign is 25 ft. high and projects 8 ft. from the building. A white cross, 6 ft. by 4 ft., of gas-filled lamps will blaze at the top, with an American flag in colored bulbs just below, and beneath that the flag of the church, a blue square and red cross on a white field. Finally the name of the church appears in gigantic letters, with the legend "Always Welcome." A large illuminated clock is included in the arrangement.

ORCHARD-SPRAYING TRUCK HAS REMOVABLE TANK

A motor truck with special chassis and removable tank is now being put out for the use of the farmer in sprinkling roads, for distributing liquid fertilizer, and more particularly, for spraying gardens and orchards. These operations the truck performs quickly because it can be run almost continuously, if one tank is filled while the second is being emptied. Each tank is provided with a platform, or running board, and two nozzle connections on either side, making it easy to work upon two rows of trees, shrubs, etc., simultaneously. A suction valve facilitates filling when the tank is not removed.



This New Orchard-Spraying Truck is Featured by the Fact That the Tank can be Removed Easily When Emptied. If Two Tanks Are Available the Truck can be Operated, Obviously, with a Minimum of Time Lost in Refilling. Each Tank is Provided with a Running Board and Two Nozzle Connections on Each Side

HEAVY METAL CUT WITH TORCH IN RECORD TIME

In just a few minutes more than an hour an oxyacetylene operator made seven cuts, totaling 91 in. of solid metal,

Cutting through 91 Inches of Solid Metal in Slightly over an Hour Is the Record of a Single Operator Using an Oxyacetylene Torch

through forged-steel shafts varying from 12 to 14 in. in diameter. Eight minutes were required for each of the two cuts from the 12-in. shaft, 10 minutes to make each of the three 13-in. cuts, and it took 12 minutes to sever each of the 14-in. sections. In making the seven cuts, 1,400 cu. ft. of oxygen and 120 cu. ft. of acetylene were used. In cutting metals, large quantities of oxygen are needed to produce the oxidizing flame required.

KITCHEN SINK IS ADJUSTABLE TO HEIGHT OF HOUSEKEEPER

The adjustable sinks now being manufactured by an American company will be appreciated most by the housekeeper who realizes that much of her fatigue is caused by working over a kitchen sink that is too high, or, more commonly, too low. Adjustability is secured by means of telescoping conduits and supports which are shortened or lengthened by turning a horizontal handwheel. Considered apart from its adjustable supports, the sink is enameled inside and out, and is provided with a shelf for soap, scouring powder, and other necessities.

The Housekeeper Adjusts the Supports of the Sink to Her Height by Turning a Horizontal Handwheel

SMALL SOY-BEAN HARVESTER RUNS BETWEEN CORN ROWS

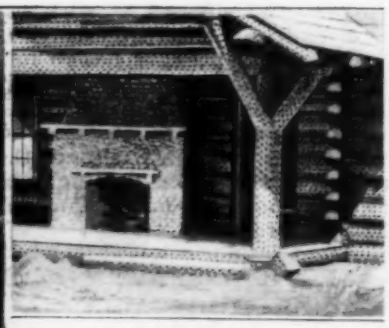
Soy beans planted between corn rows, as is the custom on many farms, may be harvested without disturbing the corn by a machine now on the market. The harvester, with a tread only 39 in. wide, will readily work between corn rows 4½ ft. apart, and two mules can haul it easily. The body, which holds 15 bu. of beans, may be adjusted from 4 to 12 in. above the ground. The bean plants pass into an opening at the front, as the machine progresses along the row, and a revolving beater, weighing 200 lb. and striking 25 blows at each revolution, removes the beans. The heavy beater acts as a flywheel, enabling the harvester to handle a tangle of plants without clogging. A rider with a pitchfork removes the plants at the rear as the beater, having separated the beans, passes them back.

The Bean Harvester, Drawn by Two Mules, Working between Corn Rows: The Bean Plants are Seen Issuing from the Body at the Rear

WOODSMAN BUILDS LUXURIOUS CABIN FOR BUSINESS MAN

Instructed by a wealthy business man to work out his own ideas with no regard for expense, a former forest ranger has constructed for his employer, on the shores of Lake Crescent in northwestern Washington, a well-nigh ideal three-room log cabin. The walls he built from logs of Douglas fir, after peeling, mottling, and

The Back Porch of the Luxurious Cabin is Provided with a Large Stone Fireplace for Use in Pleasant Weather. From the Porch One Steps into the Spacious Living Room



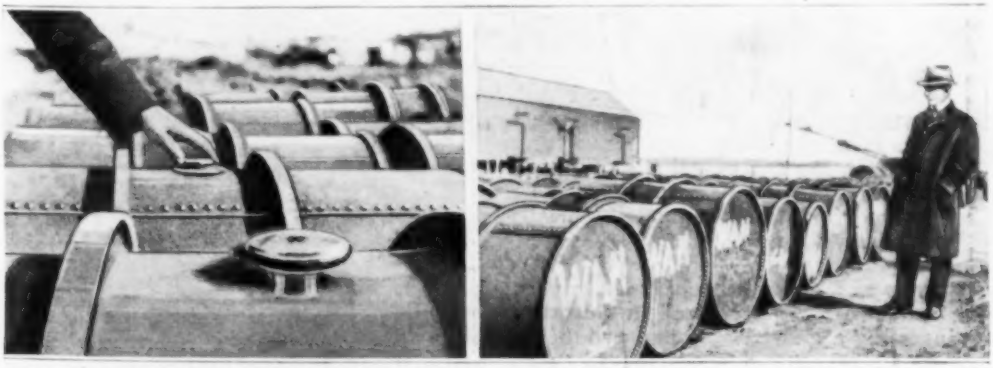
This Close-Up View of the Back Porch Emphasizes the Curious Appearance of the Logs. Each was Peeled, Mottled with a Hot Iron, and Coated with a Preserving Oil Before being Put into Place

coating with preserving oils each log. On the wide-eaved roof he laid "shakes," or giant shingles, of red cedar. To draw the smoke from the wide fireplace in the middle, or living, room, and from the other on the back porch, he built a massive chimney. At some distance from the cabin he erected a shed for the small power plant, which supplies current for the lights and for the electric heaters installed in every room. This current heats the water, too, for the basins and shower baths in the cement-floored bathroom. The side of the living room which faces the lake the ranger built largely of glass, so making the most of a matchless view of wooded shores and rugged mountains.

This Front View of the Cabin was Made from the Little Pier Which Extends into the Blue Waters of Lake Crescent. The Front of the Living Room is Seen to be Composed Largely of Square Panes of Glass

WHALING BARK STORES CATCH IN SHEET-IRON BARRELS

Though the Norwegians were expert whalers 1,000 years ago, the venerable industry is far from the familiar senility which scorns the manners of today. A proof of this was offered recently when an American whaling bark put into an eastern port and discharged its cargo, not

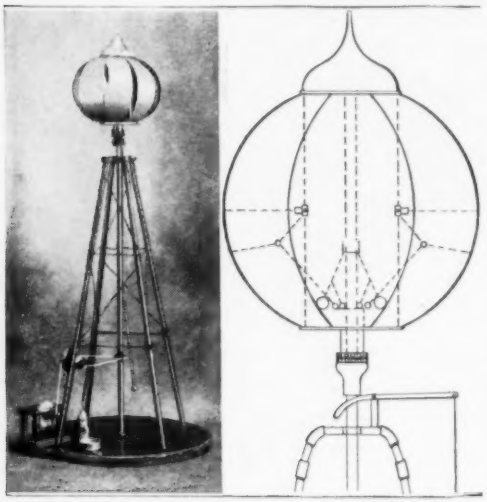


At the Right Are a Number of the New Sheet-Iron Barrels Containing Part of the Bark's Catch of 1,100 Barrels for the Year. The Close-Up at the Left Shows the Encircling Bands of Iron with the Screw-Cap Bung between Them

in the old-fashioned wooden casks, but in cylindrical, sheet-iron barrels. These are of rather peculiar design in that the mid-section of each is encircled by two heavy bands of iron. Between these is the bung, of the screw-cap type. Thus the bands not only stiffen the barrel against crushing or denting forces, but, more important, make damage to the bung improbable.

VERTICAL-SHAFT WINDMILL HAS ADJUSTABLE VANES

Automatic control and hand adjustment are both provided for the regulation of a new type of windmill designed



Left: A Complete Working Model of the New Windmill. Right: Diagram Showing Governor and Lever Control

by an Ohio inventor, which has the further merit of symmetrical shape and ornamental appearance. The machine is of the vertical-shaft variety, and the segment-shaped vanes, pivoted at top and bottom, are arranged in the form of a sphere, with a centrifugal governor mounted inside. With one edge of each vane turned into the wind, the maximum power is developed, but when set to form a closed ball, the mill remains motionless. This adjustment, normally performed by the governor, may also be made by means of a hand lever.

¶ Barrels and casks, especially those used for beer, are being sterilized in Germany by inserting a quartz lamp and producing ultraviolet rays for a period of 15 to 30 seconds. A longer exposure is likely to decompose the pitch lining of the casks.

ODD SCHOOL MIXES PRACTICAL EXERCISES WITH STUDY

Believing that children are harmed rather than benefited by long continued application to theoretical study, an Australian educator has built a new school of peculiar character. A large gymnasium occupies the center of the one-story building, which accommodates some 450 pupils. The classrooms are around the outside, with glass-paneled walls that swing outward, and glass doors that open into the gymnasium, giving unlimited circulation of air. Though the morning sessions are of the conventional order, in the afternoon gardening and various handicrafts are substituted, of a nature calculated to train the hand and eye as well as the mind. The work of the day is interspersed with properly directed periods of exercise in the gymnasium.

TROUGHS MAKE ARID FOREST LAND AVAILABLE AS PASTURE

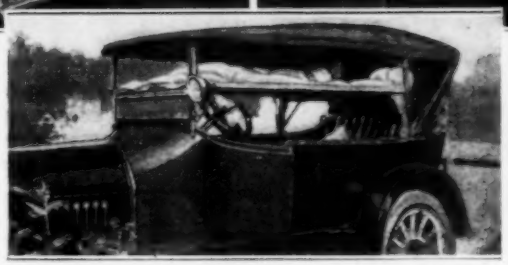
The pastures of one national forest in a western state have not been available for sheep grazing, in the past, because of the scarcity of running water. Small springs have lately been discovered, however, in several parts of the preserve. As a result, the forest service has recently had constructed a number of sectional, galvanized-iron troughs which are set up in any desired length beside the tiny springs. One of these troughs, typical of the others, is fed through a short pipe and has a capacity of 500 gal. It measures 51 ft. long, 11½ in. wide, and 22 in. deep. Conserved in troughs of this sort, the water supply, though scanty, is sufficient for the flocks admitted to the area.

Water from the Tiny Springs is Conserved in This and Similar Troughs, Making the Pastures of the Forest Available for Sheep Grazing

DOUBLE-DECK AUTO BED BILLETS WHOLE FAMILY

The Back of the Front Seat in Lowered Position, Ready to Receive the Bedding

Side View of the Upper Berth Made and Occupied, and the Lower Partly Made

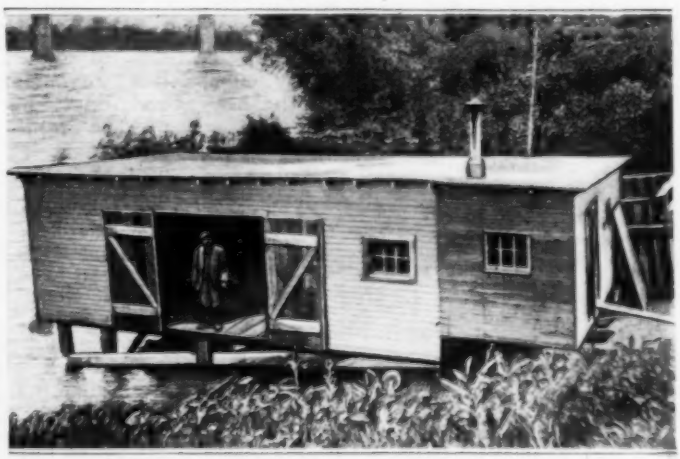


The Whole Automobile Converted into a Double-Deck Bed, Accommodating All the Passengers

All that is necessary to make a comfortable bed in an automobile, with a California man's invention, is to release two catches, lower the back of the front seat on hinges, and spread bedding on the three cushions thus assembled. This arrangement not only saves cutting down the height of the seat back, as is sometimes done, but puts it to use as part of the bed. A compartment back of the rear seat carries a folding cot, with legs at one end to fit the edge of the car body, and clamps at the other to fasten it to the windshield posts. This, when set up, forms the upper berth of a sleeping compartment commodious enough to accommodate a whole family. When side curtains have been added, the car resembles in comfort and privacy a Pullman section.

WHARF HOUSE ON ROLLERS MEETS ALL RIVER LEVELS

One of the chief problems of waterway transportation, the great and often sudden changes of river level, is met on the Ohio River in West Virginia by setting the wharf houses on small, wide-tread wheels, or rollers. Inclined wharves, paved with brick, run down into the water, and the house is moved up or down, to keep it at the river's edge, by means of a ½-in. wire rope, wound on a small winch on the bank. The building measures 16 by 32 ft., 6 ft. of the shore end being the office. Telephone connections are made through a reel of wire attached to the wall, which is turned to take up the slack as the house is pulled back out of the rising water.



The Wharf House, Resting on Rollers on an Inclined Brick Wharf, is Kept at the Water's Edge as the River Level Changes

HOLE IN CAVERN ROOF TRAPS WATER FROM STREETS OF TOWN

Towns that "just grow up," like Topsy, often have no drainage systems and become breeding places for all manner of

The Drainage Shaft in the Center of the Sink Hole was Lined with Cement and Provided with This Manhole Top

disease. Such a town was Orleans, Ind. Situated in the heart of the limestone region where there are few creeks and brooks, and fewer rivers, where the hills pile up one after another, and the valleys end in a hill, with no chance for drainage, this town often found itself in a pond of water which drained slowly through one lone sink hole near the edge of town.

A sink hole, in this section, is a low place where the water collects and seeps through to the underground rivers and creeks in which this territory abounds. And this particular hole held the drainage not only of the town but of the territory for miles around. A severe rainstorm flooded cellars and streets and at times made the town almost uninhabitable.

A remedy for the trouble was sought recently, and at last one of the "city dads" ventured the proposition that if the bot-

The Conduits Which Carry the Water to the Shaft are Provided with Flat Covers That Resemble a Sidewalk

tom of this sink hole were blasted out, the problem would be solved. Accordingly, in the soft ground at the center of the hole, a shaft was sunk about 20 ft. to the solid rock. This rock stratum was then drilled, and a hole blasted through to the cavern over which the town is built. A series of conduits, which look, from above, much like sidewalks, were built through those sections of the town where the water gathered most easily, and were led to the shaft, now neatly cemented and covered. This device has entirely eliminated the flood nuisance.

AIRDROME USES RAILROAD-CROSSING WARNING

As the roll of a landing airplane can never be adequately controlled, warning signs along roads bordering an unfenced airdrome are now becoming common. These signs usually take the form of a simple rectangular signboard, advising the teamster or motorist to look around before proceeding. But at the

This Warning Sign at the Airdrome Edge Gains Effectiveness through Its Resemblance to the Familiar Crossarms at Railroad Crossings

side of one field have now been erected less conventional signs that catch the eye unfailingly because of their resemblance to the familiar crossarms at railroad crossings. The words "Airplane Crossing" are painted on them in large letters.

FORT, RELIC OF INDIAN WARS, IS PERFECTLY PRESERVED

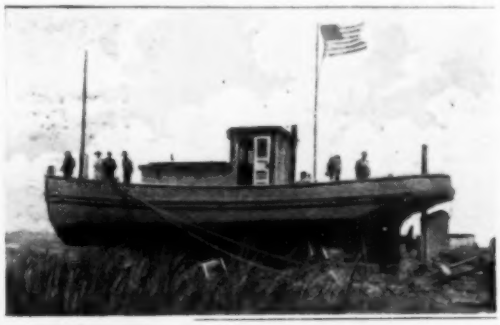
Less than half a century ago almost every American community west of the Mississippi was protected against Indian raids by a fort or stockade. Most of these structures have now fallen into dust. In southern Utah, however, is a stone structure, known as "Cove Fort," which was built in 1867, at the time of the Blackhawk-Mormon War, yet is today in a state of perfect preservation. It is now used, in fact, as a ranch house and hotel. The four outer walls are each about 100

The Inscription over the Entrance of This Fort in Southern Utah Proclaims That the Structure was Built in 1867. Despite Its Age, the Fort is Now Used as a Ranch House and Hotel

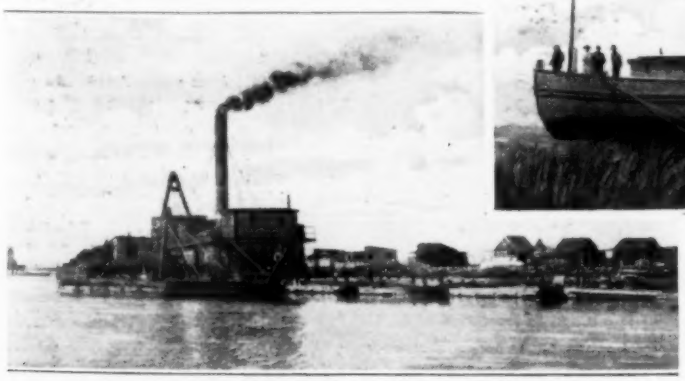
ft. long, and are built entirely of stone. They are pierced only twice, once by a small postern in rear, and once by a large entrance in front. The larger doors are formed of two thicknesses of heavy planks, the space between which, according to the present owner, was formerly filled with sand.

CONTROLS OF NEW MOTOR TUG CENTERED IN WHEELHOUSE

Centralized in the wheelhouse of an unusual motor tug, built recently for an eastern shipyard, are devices which make it possible for one person to control every movement of the vessel. In addition to the regulation steering wheel, there are a fuel valve, for regulating the engine's speed, and levers for starting, stopping, and reversing the propeller. Crude oil is utilized by the 100-hp. driving motor, which is installed underneath the wheelhouse in plain view of the pilot. The fuel tanks have a capacity of 700 gal. Extremely satisfactory service has been rendered by the craft. To illustrate the boat's tremendous pulling power can be cited an instance where it moved an assembly consisting of a huge dredge; a scow, loaded with 273 tons of coal; a floating derrick, and 40 pontoons, the latter supporting a large dredging pipe. Such a task ordinarily requires two steam tugs. The vessel is 51 ft. 2 in. in length; has a beam of 14½ ft., and a draft of 5 ft. Its construction is very substantial, frames and planking being unusually heavy, but because of its arrangement, it is as easily handled as a light motorboat.



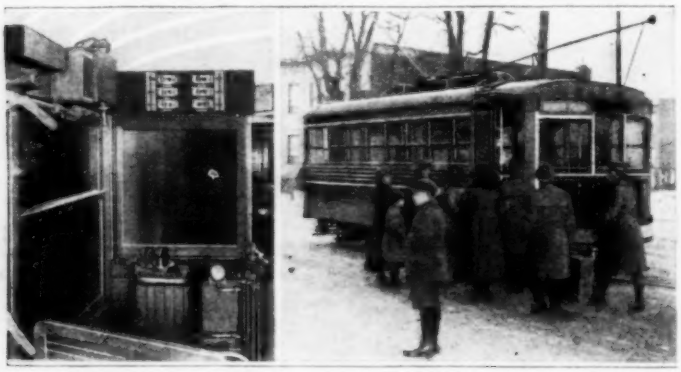
All the Controls of the New Motor Tug are Centralized in the Little Wheelhouse



One of the Heaviest Loads Towed by the Tug to Date Was This Assembly, Consisting of a Large Dredge, a Loaded Scow, a Floating Derrick, and a Dredging Pipe Borne on 40 Pontoons

ONE-MAN STREET CARS FITTED WITH SAFETY SWITCH PANELS

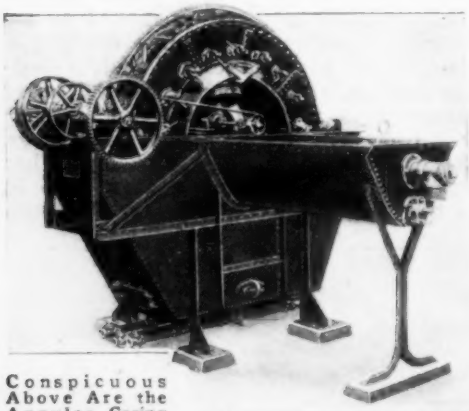
That it may be impossible for the motorman to come into contact with live parts either while controlling the car or renewing fuses, the makers of 200 new one-man street cars recently put into service in New York City have installed in each a safety switch panel. This is mounted above a vestibule window where it can be reached easily by the motorman. Six handles project from the panel, bearing the names "Headlight," "Buzzer," "Register," "Main Light," "Heater," "Compressor." These switches are all single-pole, with the exception that the headlight switch is double-throw, to provide for the transfer of current from the front to the rear. Each switch is separated from the others by means of partitions of molded asbestos, and is reached by means of a door which is so interlocked with the mechanism that it can be opened only when the current is broken.



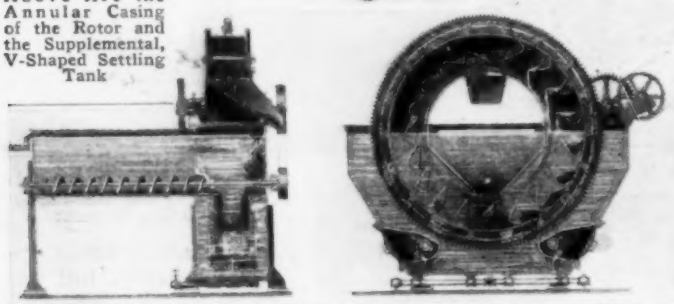
Safety Switch Panels of the Kind Seen above the Motorman's Window at the Left were Installed in 200 New One-Man Street Cars Recently Put into Service in New York City. One of These Cars is Pictured at the Right

DEWATERING MACHINE FOR ORE-DRESSING PLANTS

A new machine, representing a complete departure from usual methods of dewatering granular solids, is now being manufactured for use primarily in ore-dressing plants. It consists in the main of a deep, narrow water tank which has a primary settling chamber within its upper central portion and a feed-inlet trough at one side. The concentrates, tailings, or other feeds, enter this chamber through the trough; and at once the coarser solids sink to the outlet at the bottom. Here they encounter the buckets of a revolving rotor and are carried upward, past the water level. As the bottom of each bucket assumes a horizontal position the water drains off. At its uppermost position, the bucket trips itself and so dumps its contents into the discharge spout. The overflow from the primary settling chamber passes into a settling tank of V-shaped cross section, where the finer solids sink to the bottom to be pushed back to the primary chamber by a screw conveyor.



Conspicuous Above Are the Annular Casing of the Rotor and the Supplemental, V-Shaped Settling Tank



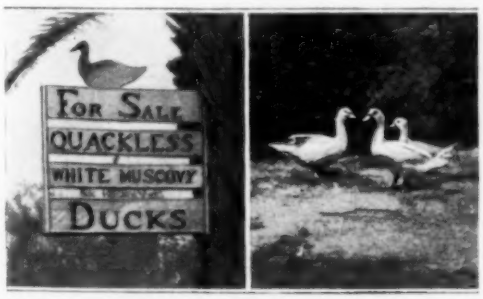
The Action of the New Dewatering Machine is Explained by These Side and Front Cross-Sectional Views. The Action of the Screw Conveyor can be Studied at the Left; That of the Buckets, at the Right

DESPISED MANGO MAKES GOOD IN SOUTHERN FLORIDA

That the mango of the East and West Indies, often likened to a ball of twine soaked in turpentine and molasses, is in reality one of the most luscious fruits in the world is apt to be the belief of those who visit the Plant Introduction Field Station at Miami, Fla. Here, through the work of explorers of the Department of Agriculture, and through exchange with East Indian agricultural authorities, about 70 varieties have been obtained and studied. Of these there have been selected for cultivation about 20, some of them as free from fiber as a peach, and as easily opened and eaten as a cantaloupe. As a result of the work done at this station, it is felt that the mango as a tree crop has come to stay in southern Florida.

QUACKLESS DUCKS FOR THE BACKYARD POULTRYMAN

No longer will the quacking of the backyard poultry raiser's ducks call down upon his head the wrath of his neighborhood, for ducks without a quack are being introduced in the United States. This comparatively new breed of ducks is known as the "Muscovy" and is a native of Russia. They make good mothers, are splendid layers, and fatten early for the market, many of the fowls weighing seven pounds dressed when three months old.



Comparatively New in This Country, the Muscovy Duck, a Native of Russia, is Fast Making Friends Because of Its Quackless Qualities

OLD CHURCH REMODELED INTO APARTMENT BUILDING

Ten small but comfortable living apartments, each of two rooms and a bath, have just been added to the housing capacity of a Michigan city by remodeling a large church. The building had not been used for some time, and was about to be wrecked when an enterprising contractor realized its possibilities as a multi-family dwelling. The demand for its accommodations is justifying his decision to revamp the old structure.

The Old Church in Process of Reconstruction as an Apartment House: Finished, It Contains 10 Flats, Each of Two Rooms and Bath

ORNAMENTAL TEE STAND FOR GOLF LINKS

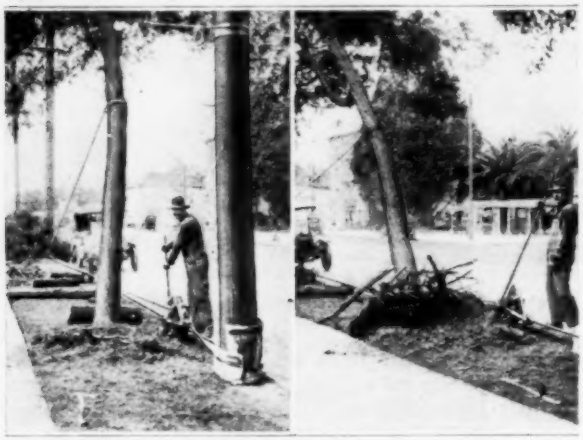
Golf clubs having an eye for the beautiful will find the accessory shown in the illustration of interest. It is a tee stand, made of metal and provided with a trash box at the bottom, sand and water buckets, and a scrub brush with which to clean the balls. Club colors and hole numbers are usually painted on the lower bucket for purposes of identification.

TREE MOVING NEW ENTERPRISE OF WESTERN CITY

BY JOHN EDWIN HOGG

RECOGNIZING that the average citizen, or average laboring man, knows about as much about moving trees as a hound does about arithmetic, a group of Los Angeles men have organized a company which has for its purpose the transplanting of trees, and the removal of trees and stumps about the city.

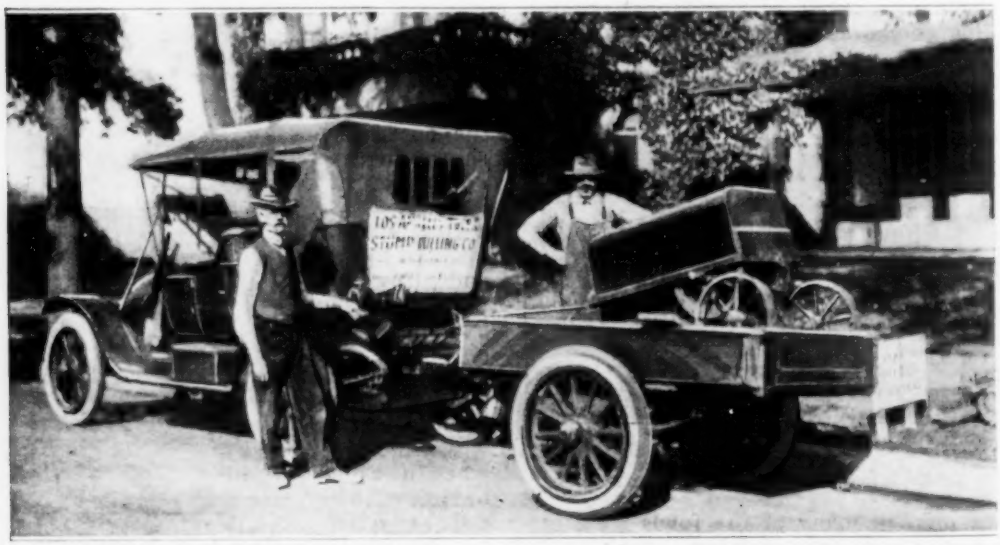
With the services of this company at his disposal, the citizen is no longer compelled to rely upon his own efforts, or those of inexperienced labor, for such operations. The work is a highly specialized form of labor, and the citizen now need but call upon this firm for a more efficient and less expensive job than could be obtained otherwise. The tree and stump company is a decidedly mobile organization. Its men travel in automobiles, carrying their tools and tree-moving machinery in trailers behind the cars. Thus equipped they are prepared to go quickly to any location about the city wherever their services are required.



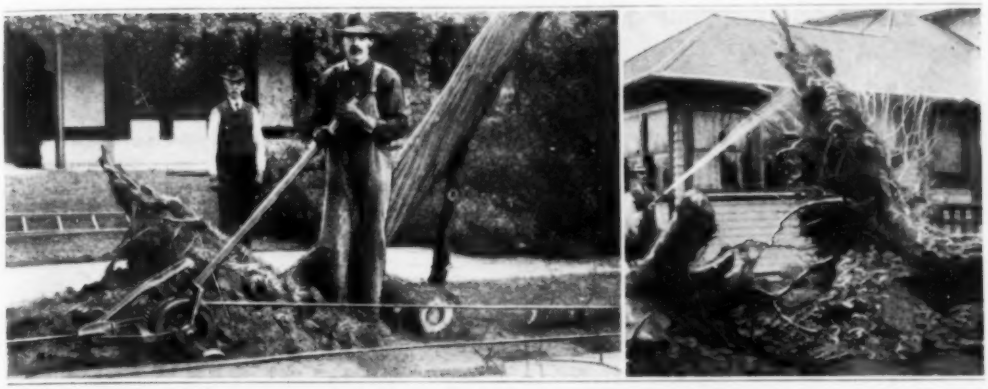
Left: Starting to Pull Down a Tree by Means of the Steel Cable and Windlass Mechanism. Right: The Same Tree About Ready to Fall

The mechanical appliances of tree transplanting, and tree and stump removal, are few and simple. There is an abundance of block and tackle equipment for the handling of large heavy trees, and a compact windlass of special design is used for pulling trees out by the roots. With this machine, leverage is used to save labor. A steel cable is attached to the upper branches of the tree to be removed, and the windlass mechanism is then attached to another tree, or other firm fastening. Inasmuch as the windlass exerts a powerful leverage, it readily pulls up the tree instead of its anchorages. A few movements of the hand lever of the windlass tightens the cable, and in due time over comes the tree—roots and all—ready with little more labor, to be hauled to its new location.

When a tree is merely to be removed, a stream of water played from a hose is used to dislodge the earth from the roots. This is put back in the hole after



The Mobile Tree and Stump Movers Ready to Answer a Call to Any Part of the City, with All Their Equipment of Block and Tackle, Steel Cable, and Windlass



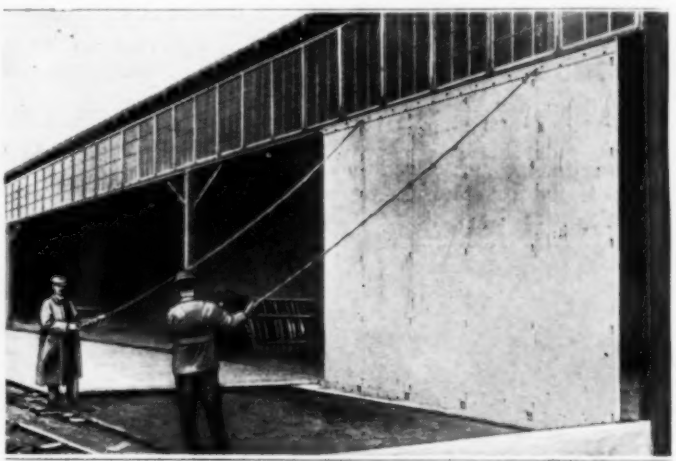
Left: The Tree Pulling Windlass Mechanism, Which Exerts a Leverage Powerful Enough to Enable One Man to Pull Down the Biggest Tree Single-Handed. Right: When Trees are Merely Removed, a Powerful Jet of Water is Used to Dislodge the Earth from the Roots

the tree has been taken out, and the tree itself is then cut up and stored in the owner's cellar for firewood. When a tree is to be transplanted, a deep excavation is made around the roots. The largest roots are cut off as far down in the ground as possible, and the tree is then pulled down with the windlass with as much of the earth as can be retained. If the tree has to be moved any great distance, heavy wire netting is wrapped about the roots to hold the earth intact. This is then reinforced with rope, and the tree is jacked onto roller dollies for transportation. At its new location the wire netting is removed, and blocks and tackle are used to hoist it into position.

In the few months the company has been in business, its services have been the means of preserving many fine trees that would otherwise have been destroyed, and in the removal of stumps and trees, it has been the means of saving substantial sums by reason of its specialization upon this work, and increased efficiency in getting it done.

NEW HANGAR DOOR RESEMBLES ANCIENT DRAWBRIDGE

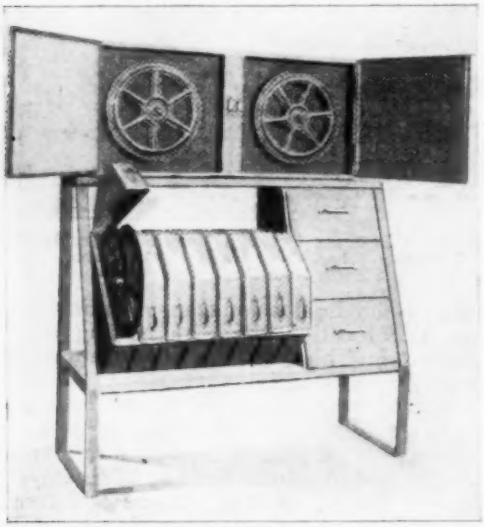
A new-fashioned door for airplane hangars has recently been invented by a major in the Quartermaster Corps, and is now being tried out in at least one government flying field. The door is not unlike an ancient drawbridge, consisting as it does of a wooden surface which serves, during the daytime, as a platform in front of the hangar, and during the nighttime, as a door. The counterweight is of concrete, and moves in a pit beneath the hangar floor. The hinges are placed along the edge of the floor, and are so disposed that the operation of the door is oddly automatic. To swing it down, for example, two men must pull vigorously at the two ropes provided. Pulled down a short distance, the door then settles lightly into place. Similarly, to swing it up, two must lift the outward end above their heads. In this position the door becomes unbalanced again, and closes by its own weight, or more exactly, by that of the counterweight beneath the floor.



A Vigorous Pull on the Two Ropes Unbalances the Counterweighted Hangar Door, and Causes It to Settle Lightly to a Horizontal Position

FIREPROOF FILM FILE FOR PROJECTION ROOM

The latest device for the convenience and safety of motion-picture operators embodies a film file and film rewinder, in



The Latest Device for the Motion-Picture Projection Room Is a Fireproof Film File with an Electrically Operated Film Rewinder

a fireproof metal cabinet. The bottom part is provided with separate compartments for several reels of film in the order of their exhibition. Drawers are provided for the storage of projection lenses, announcement slides, arc-lamp carbons, and other supplies. On top is mounted an inclosed film rewinder which is operated by a small electric motor.

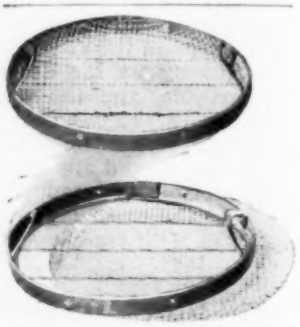
BIG SCOOP CLEANS CITY SEWER MAINS

An odd scraping apparatus, not unlike an overgrown sugar scoop, is now used periodically for cleaning the sewer mains of Salt Lake City. A number have been built, for use in mains ranging from 42 to 64 in. in diameter. Along the forward edge of each are fixed four wheels, or casters, which facilitate progress down the main. In rear is a framework which makes contact with the walls of the main and so keeps the back of the scoop approximately vertical. Usually the flow of the sewage carries the scoop from one manhole to the next. Occasionally, however, an obstacle is encountered, making it necessary for the workmen to pull on one or the other of the ropes fastened to front and rear.

When the Sewer Mains of Salt Lake City are to be Cleaned, the Flow of the Sewage is Made to Carry with It This Odd Scraper

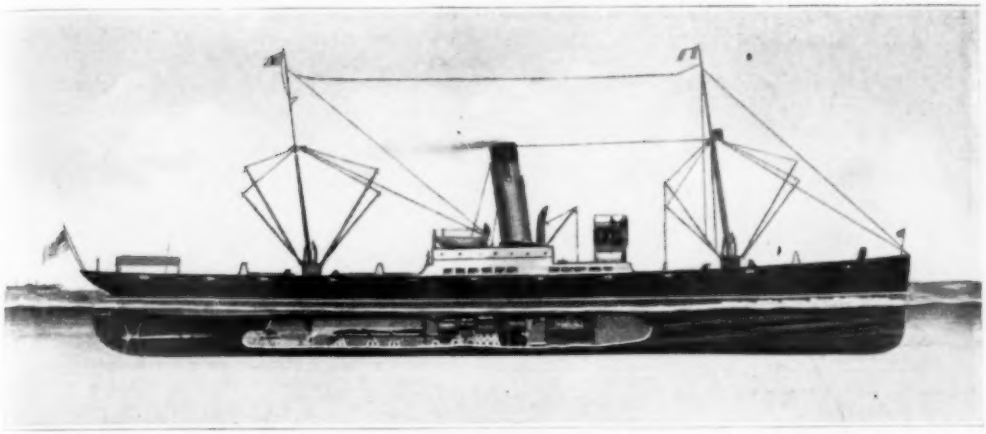
SAND SIEVE FOR FOUNDRY HAS RENEWABLE SCREEN

As part of an automatic, gyrating sand sifter, now offered to foundrymen as an item of labor-saving machinery, the form of renewable sieve used is an interesting detail. Instead of the customary wooden hoop, one of heavy steel is used. The screen itself, made of strong wire cloth, galvanized after it is woven, is fastened into the hoop by bolts through its upturned edges, and is readily removed for renewal. A saving of 30 per cent is said to be effected by this method, as compared with the use of wood hoops.



SPECIALISTS JOIN CLINIC TO AID RURAL PATIENTS

For three days recently, the residents of a certain rural district of New York state enjoyed the opportunity of consulting with some 20 noted medical and surgical specialists, in a visiting clinic held under the auspices of the state department of health. The work was divided into seven distinct groups of subjects, including the study of obscure diseases beyond the skill of local practitioners. A large number of patients took advantage of the unusual privilege, and a corps of competent nurses was provided for their care. The clinic was the first of its kind, and present plans call for further development of the beneficent arrangement.



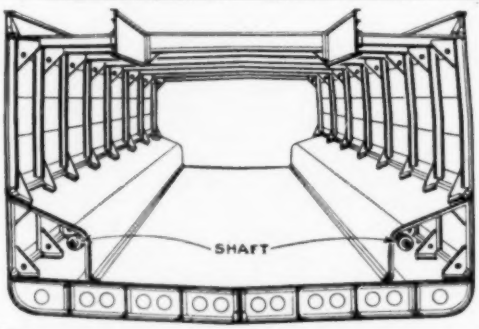
A Revolutionary Idea in the Disposition of Propeller Shafts in Cargo Boats, Designed to Carry Bulk Cargoes of Coal, Ore, and Similar Materials, Increases the Hold Capacity and the Convenience of Removing the Loose Cargo at Its Destination. Centrally Located Shaft Tunnels Reduce the Speed of Unloading and Increase Handling Costs

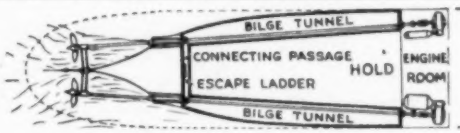
NEW BILGE-TUNNEL SYSTEM ADDS TO CARGO CAPACITY

Surprisingly large cargo space characterizes two sulphur-carrying steamships recently built at Newburgh, N. Y., as a result of a new, patented arrangement of the twin propeller shafts. Ordinarily these shafts would have been mounted in tunnels placed near the center line of the ship, thereby breaking up the floor of the after holds into useless wing and central pockets. But the new arrangement places the two power units as far outboard as possible in the engine room, and consequently locates the shafts along the after bilges and run of the vessel, or in other words, near the joints of sides and bottom. It is obvious that, when the shafts are covered with sloping-topped, self-trimming tunnels, the hold becomes hopper-shaped, and so is ideally suited for the stowage of ore, coal, sulphur, and other loose cargo. There are no obstructions, furthermore, to interfere with the efficient use of the grab bucket.

STEPS AND GUTTER COMBINED IN CONCRETE DRIVEWAY

A driveway that is slightly "different" has been built through an orange grove. The elevation of the grove above the street grade is considerable, so that two steps have been molded between the runways; the latter serve as gutters to carry off excess rainfall during the rainy season, and thus help to drain a considerable part of the grove.





By Arranging the Twin Propeller Shafts of a Bulk-Cargo Boat in Shaft Tunnels on Opposite Sides of the Hull, as Shown in the Sectional View at the Left, the Break in the Floor Space Caused by a Centrally Located Shaft Tunnel is Avoided. The Hold is Thus Better Adapted for the Stowage of Bulk Products, Such as Ore and Coal. With Shafts Disposed in This Manner They as Well as the Engines must be Placed at an Angle to the Keel, as Shown in the Smaller Drawing

PHONOGRAPH MUSIC RETAILED AT TWO CENTS A RECORD

Although occidental ears rarely if ever react favorably to Japanese music, the Japs themselves are quite partial to native

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A Traveling Phonograph Equipment Popular in Japan: Rubber Tubes Lead to the Ears of the Listeners, Who Pay a Small Fee

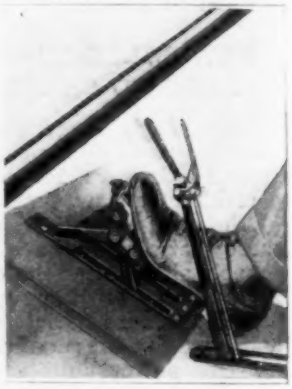
music, and traveling minstrels with phonographs mounted on carts collect most of the loose change in circulation on the countryside by retailing their music at the rate of two cents a record. Rubber tubes lead from the reproducer to the ears of the listener, who relinquishes his place when the record has been played.

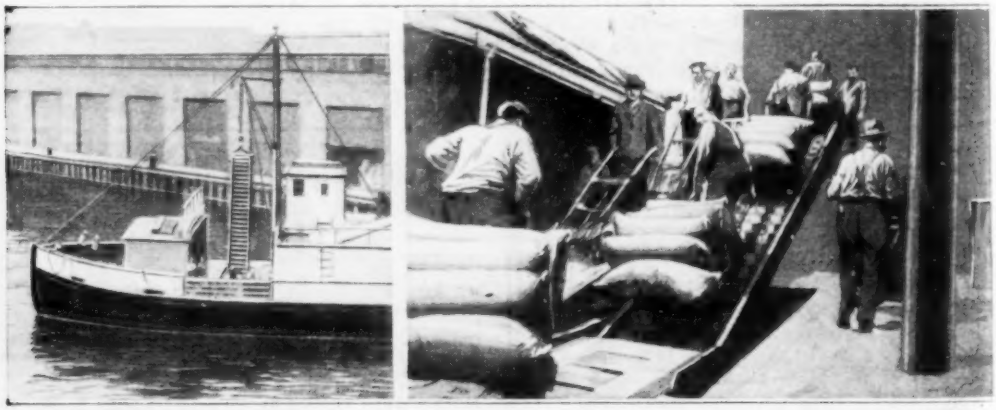
CONVEYOR ON RIVER STEAMER ADJUSTABLE TO ANY PIER

Convenient adjustment to the height and position of any pier is the feature of a form of loading conveyor installed on certain western river steamers. The base of the conveyor is mounted on a four-wheeled truck, running on tracks laid across the boat a few inches below the deck level. The endless-belt section, consisting of steplike steel links, can be placed at any angle. It is driven by a shaft between and parallel with the track rails. As the conveyor is moved back and forth on the rails, the driving gear slides upon the shaft. The form of the conveyor links permits the wheels of a hand truck to rest upon them, thus hoisting truck, load, truckman, and all.

AUTO ACCESSORY CONTROLS CLUTCH PEDAL

An accessory now marketed for attachment to the clutch pedal of a well-known low-priced automobile makes driving easier for the inexperienced by stopping the pedal automatically at "neutral." This effectually checks the tendency, exhibited by the driver who has not acquired the necessary "sense of touch," to move too quickly from "high" to "low," or vice versa. To release the pedal from its midway position, the driver presses a catch, or trigger, with the tip of his shoe. The accessory is easily attached.





Left: The Adjustable Conveyor Extended from the Ship's Deck to the Pier. Right: A Close-Up View of the Conveyor in Action, Showing How It Carries Hand Trucks and Truckmen as Well as Their Loads

KIDE WORLD PHOTO

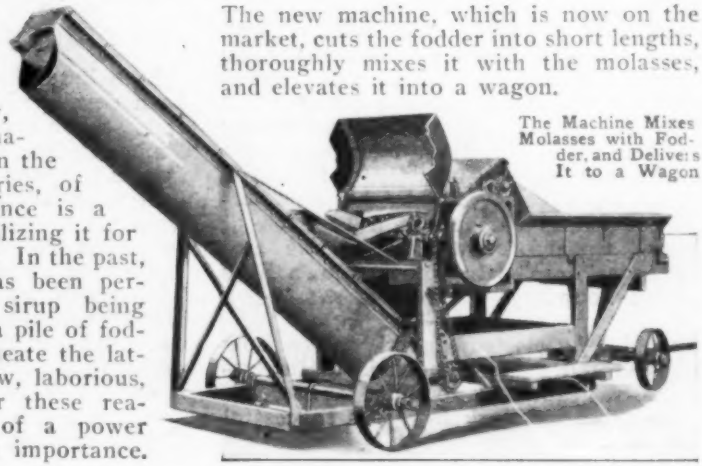
INTERESTING PHOTOGRAPH OF CONEY ISLAND SNAPPED FROM AIRPLANE

INTERPRETATION of aerial photographs of the western front was a difficult business intrusted only to trained specialists. But few of the millions in New York City, many of whom have never seen such a photograph, would fail to identify the subject of the interesting airplane view above. It is one of the most frequented amusement parks of the world—renowned Coney Island, off the south shore of Long Island. Conspicuous are the crowded "Midway," the "Scenic Railway," the "Shoot the Chutes," and the various other "rides." The waterfront can be seen at both the top and bottom of the picture, the strip at the top being one of the popular bathing beaches.

POWER MACHINE MIXES MOLASSES AND FODDER

Rich in digestible carbohydrates, molasses makes a well-balanced feed for cattle and hogs when mixed with hay, straw, or other similar material, and stock raisers in the vicinity of sugar refineries, of which the sweet substance is a by-product, have been utilizing it for some time in this manner. In the past, the mixing operation has been performed by hand, the sirup being poured on the layers of a pile of fodder, and allowed to permeate the latter. This method is slow, laborious, and unsatisfactory. For these reasons, the development of a power mixer is of considerable importance.

The new machine, which is now on the market, cuts the fodder into short lengths, thoroughly mixes it with the molasses, and elevates it into a wagon.



The Machine Mixes Molasses with Fodder, and Delivers It to a Wagon

STRIKING MEETING OF SOUTH AMERICAN PRESIDENTS

Forbidden by statute from setting foot on foreign soil during their tenure of office, the presidents of the South American republics of Ecuador and Colombia were the principals in an impressive meeting on the international boundary line. The meeting was held in the middle of a bridge over the Carchi River through which the boundary line passes. As the presidents met, and shook hands, each on his native soil, bands played and cannon roared a hoarse-voiced salute in recognition of the amity existing between the two countries. After the preliminary formalities of greeting, addresses were exchanged by the presidents, following which the executives and a large gathering of guests partook of a banquet, at which the representatives of the two countries were seated on their own sides of the boundary.

BY COURTESY OF THE SOUTH AMERICAN

Statutes Prohibiting the Presidents of Ecuador and Colombia from Setting Foot on Foreign Soil during Their Tenure of Office, an Impressive Meeting was Recently Held between the Two Executives on a Bridge on the International Boundary

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¶Guided by electromagnetic waves from an armored submarine cable, a tug recently negotiated 16 miles at the entrance to New York Bay, in a successful test of the new system of electrical piloting.

FARMERS REPORT TIMESAVING BY USE OF MOTOR TRUCKS

Figures of great interest and significance are revealed by a recent government investigation of the use of motor trucks by farmers, in which reports were obtained from 753 farms in 11 states, mostly in the East. Over 80 per cent of the farms are at least five miles, and 25 per cent are 20 miles, from market. The farmers appear practically unanimous in regarding the truck as an economy in time rather than in money, few of them reducing their work stock because of it. The trucks range from one-half to five tons, but the one-ton is the popular size, and few are larger than two tons. The time saved over horse hauling is 50 to 67 per cent, and return loads are available one-fourth of the time, while one-fourth of the owners haul for others at an average recompense of $174 a year. The average use per year is 173 days and 3,820 miles; the operating cost ranges from 8 to 20 cents a mile, and the hauling cost, including the driver's time, varies between 18 and 50 cents a ton-mile.

AIRPLANE-PARACHUTE TESTS ASSURE THEIR SAFETY

Parachutes for airplane use now have been developed to a point where severe tests seldom result in failure of any kind. Proper folding is of vital importance, and in this the students who build the parachutes are thoroughly drilled. A 300-lb. weight is used in the first test, suspended by a strip with a release wire running to one of the cockpits, while a strong cord holds the parachute to the machine. Diving from an altitude of 1,200 to 1,500 ft., while flying at 150 miles an hour, the pilot releases the parachute, breaking the cord. A 48-in. hole in the top relieves the first pressure, but is soon closed by shock-absorbing rubbers, and the descent is made at 14 to 18 ft. a second.

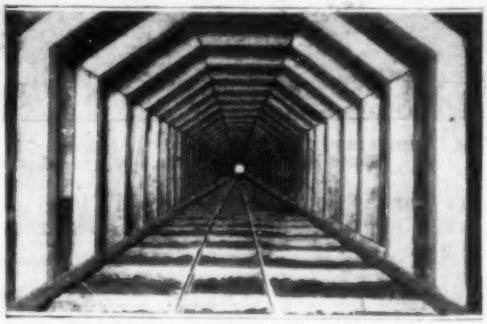
Raising the Level of the Twin Lakes of Idaho Was Part of the Plan for Irrigating the Whole of the Surrounding Sugar-Beet Country. The Wall of the Northernmost Lake was Built Up to the Required Height in the Manner Pictured Here. The Second Part of the Plan Involved the Construction of Three Feeding Tunnels

MOUNTAIN TUNNELS CARRY IRRIGATION WATER

BY FREDERIC KINNEY

ENGINEERS in the Twin Lakes region of Idaho are putting the finishing touches on a project which is expected to solve the riddle of water supply needed by the farmers of that section, who have found that sugar-beet raising is far more profitable than the growing of wheat or alfalfa, provided an ample water supply can be assured. Wheat and hay farmers generally have had sufficient water for their needs, but during the beet-watering season the supply has failed so often that the growers determined to take no further chances.

Their scheme contemplated raising the level of the Twin Lakes, miniature bodies of water capable of irrigating practically the whole of the beet-raising country thereabouts if the confining walls were built up and water carried from the inlet stream in sufficient quantities. The project also embraced the plan of avoiding circuitous routes for the ditch which was to carry the water to the lakes. To do this, it was necessary to bore through the massive rocks of the smaller mountains in the path of the proposed water ditch. Engineers said both jobs could be successfully undertaken. They are now completing the task. The two lakes are having their banks elevated 35 feet.



This Interior of the Longest Tunnel, Measuring 935 Feet, was Made Before the Walls had Received Their Linings of Concrete

Because of the Sandy Nature of the Soil, the Shortest Tunnel, 430 Feet Long, Cost Most to Construct. This Photograph of the Tunnel Mouth was Taken While the Timbering Was Still in Place

The so-called Twin Lakes receive their waters from the Mink River. The ditch, which, with its three connecting tunnels, brings the water from the river to the

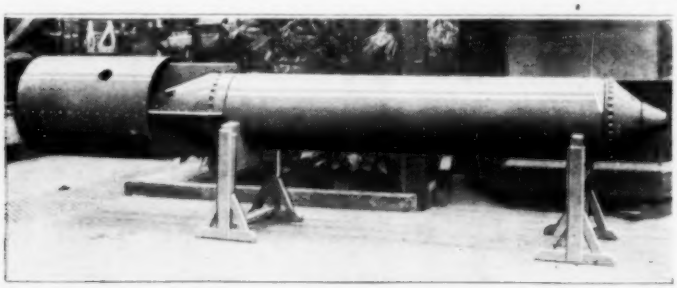
lakes, cuts out seven miles of distance and eliminates expensive and wasteful flumes. The tunnels are 8 ft. wide and 7 ft. high, the longest of them 935 ft. and the others respectively 785 and 430 ft. By this means a flow of 182 cu. ft. of water a second has been obtained, and the lakes are being transformed into one large reservoir.

At present a ridge of land, about 20 ft. high, separates the two lakes. This ridge is being cut down to the level of the water, and the shores are being walled to a height of 35 ft. Cement is largely employed in this work. Dirt hauled by donkey engines in open cars is used between lines of timber walls, these walls being buttressed by cement coverings and pilasters. It is estimated that, when filled, the lakes will supply irrigation water for 12,000 acres of sugar-beet land. They will be filled in the fall and spring, when irrigation needs are at their lowest, and drawn upon for water when the beet crop requires irrigation.

As farmers donated much labor and material, the total cost of the undertaking will amount to about $200,000 only.

LARGEST AIRPLANE BOMB WEIGHS 3,000 POUNDS

One of the most amazing exhibits at a recent British display of war material was what is doubtless the world's largest aerial bomb. Completed at about the time of the armistice signing, the huge projectile was, fortunately for the Germans, never carried over the lines. It is cylindrical in form, measures about 25 ft. in length, and, when filled with explosives, weighs 3,000 lb. As this is approximately the normal bomb load of a Handley Page war machine, it is evident that the bomb could have been carried at the usual speed and with little difficulty. The stabilizing vanes at the upper end of the long cylinder are curiously inclosed in a second, coaxial cylinder.

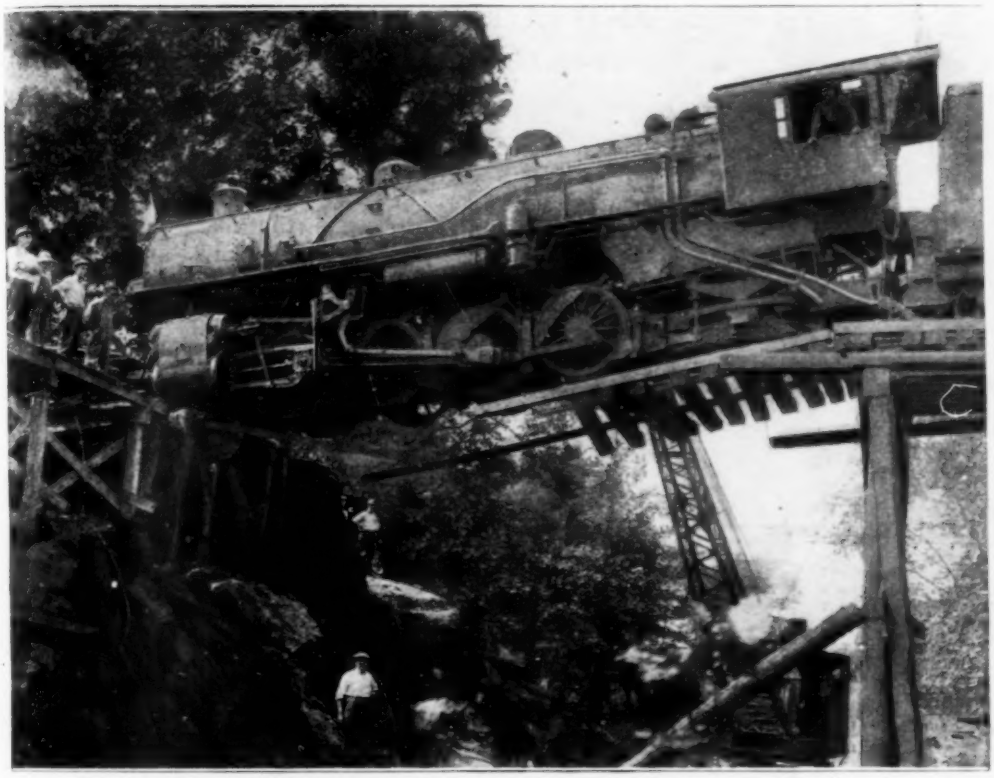


The Dimensions of This Aerial Bomb are Brought Out by Comparison with Those of the Man in the Background, at the Left

GEORGIA CANE SIRUP MADE IN PRIMITIVE WAY

Georgia cane sirup, which in the South replaces maple sirup as a spread for waffles, spoon batter bread, and grits, is still made in many rural districts in the picturesque old-fashioned way. The process requires only a press and a kettle. The press is a simple affair of two heavy disks, which are moved against each other as a patient horse treads a circular path at the end of a long tree trunk. Juice extracted here from the sugar cane is carried to the great black kettle near by. This is usually set in a large fireplace with a 10 or 12-ft. chimney of clay or brick. As the juice boils down to sirup, it is tended by a black "chef."

The Famous Georgia Cane Sirup is Still Made in a Primitive Way in Many Rural Districts. At the Left Is the Press, at the Right the Kettle. The Press Consists of Two Heavy Disks Which are Moved against Each Other



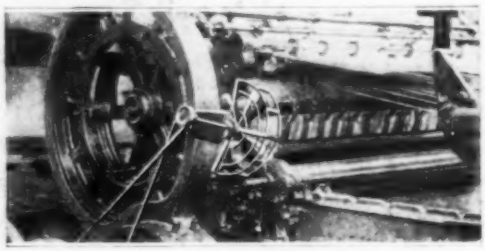
Pulling a String of Empty Freight Cars, the Big Engine Went through a Viaduct That had been Weakened at One End, Leaving the Locomotive Suspended over the Gap. The Accident Presented an Interesting Problem for the Wrecking Crew

BIG ENGINE TAKES PLACE OF BRIDGE IT WRECKS

Running slowly and pulling a string of empty coal cars, a big locomotive caused the collapse of part of a viaduct in Indiana. The earth around one end of the bridge had been loosened, and the weight of the engine caused the section of the bridge between the end and the first bent to give way, leaving the engine suspended in mid-air with its pilot buried in the earth and its pony trucks resting on the row of piling. The engine cab was precariously poised on the splintered end of the bridge. The locomotive was removed from its aerial position by building cribbing up from underneath and gradually working it back onto the uninjured section of the bridge with the assistance of a steam wrecking crane. New piling was driven through the spaces in the cribbing, which was removed after the bridge had been repaired. The damage to the locomotive did not amount to more than $250, and all members of the train crew escaped without injury.

PRINTING PRESS DRIVES FAN WHICH COOLS IT

Because, when overheated, the rollers of their larger presses become soft and cannot be used, one printing establishment of Chicago, Ill., now cools each one during the warm weather by means of a revolving fan. This is mounted near one end of the roller and at such an angle that it sends the air current down the full length. It is not propelled by electricity, but by means of a belt which runs over a small pulley on the press itself.



The Fan is Fixed near the End of the Roller and at Such an Angle That It Sends Its Cooling Current down the Full Length

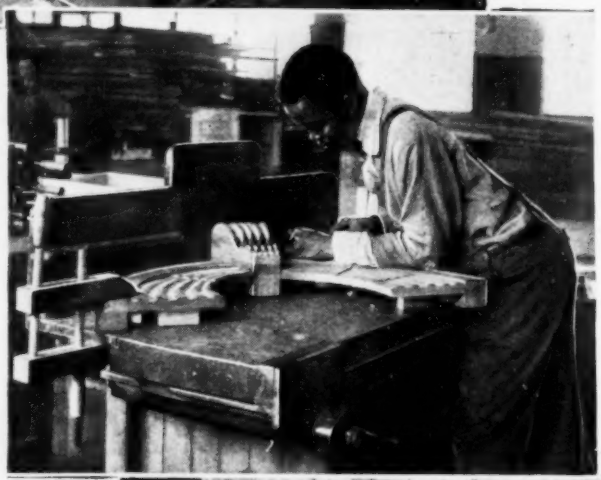
BOYS TRIM AND OUTFIT SCHOOL OFFICE

By FREDERICK HALL

In the Mill Room: Preparing the Stock to be Used in Building the Furniture and Trim of the Office

JUST what boys of high-school age can accomplish in carpentry and cabinetmaking under able direction, is well shown by the work of students of the Boston Trade School. Consent was obtained from the school authorities to leave one room of the new school building unfinished, that the boys might have a chance to fit up this room with furniture and woodwork as a part of their training.

The room set aside for this purpose was the office of the director, chosen because it was to have a number of doors of various sizes, a fireplace for which a mantel would have to be built, and bookcases that would fill a designated wall space. The architect's plans were turned over to the woodworking department for the information of the class. A copy of the plan for the master's office was made by the boys on a larger scale. Then desks, table, and chairs were drawn to the same scale. These were cut out and pinned on the plan in their proper places. By this method the boys obtained a correct idea of the layout of the room. Sketches were then made showing how it was intended to treat the walls, doors, mantel, and bookcases. These sketches were revised, and then the finished scale drawings were made of plan and elevations. Much time was spent in



Carving, with Special Cutters, the Architrave for the Big Clock Mounted over the Office Door

Assembling the Roll-Top Desk for the Director's Room, a Modern Piece of Furniture Built by the Boys from Stock Rough-Cut in the Mill and Finished by Hand

this work, as it called for actual designing and planning on paper. Then tracings and blueprints were made for use in the shop. Meanwhile other boys were designing and drawing the furniture. Each piece was planned to harmonize with the woodwork of the room. Full-size details of construction were made for all parts of the job. Later these drawings were of great help as working drawings in the shop.

Then came the making out of bills of materials, or stock lists, calling for accuracy in measuring. The detail drawings were spread out on large tables and students were assigned to measure each part on the drawings, name them, mark down on the stock list their dimensions, and give correct finish sizes in length, width, and thickness, in addition to instruction regarding milling and assembling.

The Office Finished and Furnished, Its Doors and Mantel, as Well as Its Furniture, Constructed by the Boys of the School, Who Did Much of the Designing Also

To serve as a check against mistakes, poles were laid out and marked, with each part of the work marked on them in full size. This pole work helped the boys to correct any errors on the stock lists; and also was useful in laying out the work. Only students who could do advanced work were selected. Two students started on the mantel, four went to work on the bookcases, four on the chairs, and from time to time other groups were added on other parts of the job. When a group had completed a certain assignment during the progress of the work, it was set at another task. This plan gave all the boys the same experience and opportunity.

In handling the millwork, the stock was cut in the rough, marked for identification from stock lists, and laid out on mill trucks, together with detail drawings, pole-stock lists, and blueprints. Each truck contained a job complete and was marked to identify its contents. Trucks were moved from machine to machine as required—from swing saw to jointer, surface planer, mortiser and tenoner, boring machine, shaper, and sander. The work was routed as in a modern plant. All possible millwork was completed before the stock was transferred to the assembling room and bench room. Then the actual construction began.

The first job completed was the mantel, which was made by two brothers. The students became so interested in the work that a request was made that they be allowed to work on Saturdays or to take work and tools home. The latter request was granted. One of the results of this home work was an urn which adorns the top of the mantel. It was taken home on Friday night by these two brothers and returned the following Monday with the carving completed. This urn is 20 in. high and 12 in. in diameter, and has flutings and beading from 7/8 in. in diameter down.

Special parts were made in the mill, including moldings and scrolls for carving. It was necessary to shape, grind, and temper cutters and knives to form separate parts. This work was also done by the students. The pieces were all given an eggshell gloss finish. The finishing was done in this manner: one coat of stain, a thin coat of shellac filler, shellac, and five coats of rubbing varnish, all varnish sanded between coats, and finally the whole job hand-rubbed with pumice stone, rubbing oil, and haircloth.

The material used was Philippine mahogany throughout, with the exception of the panels. The latter were made of five-ply, the cove was made of pine, with poplar crossbanding, and was finished on the outside in veneer, straight-figured African mahogany.

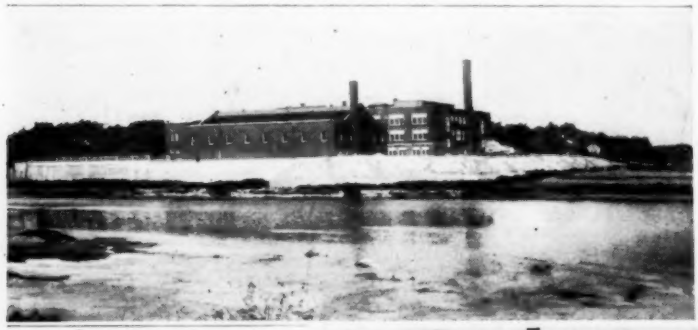
TRACTORS HAUL PROVISION SLEDS TO LUMBER CAMP

The use of tractors instead of horses for hauling hay, grain, foodstuffs, and other necessities, to a big lumber camp in Maine over 30 miles of "tote" road will be resumed next winter, the company has recently announced, because of the excellent results obtained during the 1919-1920 season. During this winter, severe though it was, two tractors and four men accomplished as much work as was formerly done by 80 horses and 20 men. And each of the machines completed the daily round trips of 60 miles without a single failure. The load usually consisted of two or three trailer sleds, each piled to its capacity of seven tons. In this way 126 tons were hauled each week. During the coming season, however, the schedule will call for a round trip and a half each day, and the load will be increased by the addition of another sled, with the result that the tractors' weekly haul will be run up to approximately 252 tons.

With 14 Tons of Hay on the Two Sleds, One of the Two Tractors is Seen at the Start for the Lumber Mill, 30 Miles Away

SCHOOL AT RIVER JUNCTION GUARDED BY DIKE

The splendid high-school building at Ottawa, Ill., located at the confluence of the Fox and Illinois rivers, now stands behind a high, defensive breastwork of earth and concrete for the reason that, several years ago, just after the completion of the structure, the two streams went on a co-operative rampage, and flooded the site. Such overflows are unusual; but the school board ordered the construction of the dike as an expression of its determination to be prepared thereafter for the worst. The wall is an L-shaped affair, one arm paralleling the rear of the building, the other the side. In the rear the wall is composed of waste from the dumps of fire-clay pits near by, and is surmounted by a wagon road; at the side the wall is of concrete, and is topped by an ornamental balustrade.



This View from the Other Shore of the Fox River Shows the Breastwork That Protects the High School

In the Rear the Protective Dike is Composed of Waste from the Dumps of Fire-Clay Pits Near By and is Surmounted by a Wagon Road. At the Side, Not Seen in the Picture, the Wall Is of Concrete

Rather Than be Balked in His Ambition to Own a Home, This Man Set Up a Sawmill and Got His Lumber for Nothing by Sawing Up Drift Logs and Telegraph Poles

LUMBER SHORTAGE AVERTED BY UNUSUAL SAWMILL

Rather than be balked in his ambition to own a home on account of the high price of lumber, a man set up a sawmill of novel design in his yard, and by sawing up old telephone poles and drift logs, got his lumber for nothing. The sawmill is operated by a 6-hp. gasoline engine and has a capacity of 1,200 ft. daily. A vertical saw, from an old cut-off saw, 48 in. long, works up and down, jiglike, from a wristpin on a counterbalanced wheel, which is attached to the drive shaft. The sawmill can be taken apart with little difficulty for transportation, and handles logs up to 30 in. in diameter.

"HIRED HELP" IN JAPAN WEAR EMPLOYER'S BRAND

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Among other strange things that are impressed upon the mind of the visitor to Japan are the devices worn on the back of the coats of tradesmen's employes. The design usually consists of the trade-mark of the employer's goods and a description of what he sells or deals in. Firemen and municipal employes also display such devices.

AUTO WINDSHIELD WINGS HAVE IMPROVED FASTENINGS

Since glass windshield wings for automobiles first came into favor, various modifications have been designed to escape the necessity of drilling the glass for fastening bolts, which naturally established points of weakness. One of the most interesting of the new forms preserves the pleasing appearance of piercing the panes without actually doing so.

Two U-shaped clamps of spring vanadium steel embrace the smoothly rounded edge of each heavy plate-glass wing, recesses in the legs of the "U" carrying rubber friction disks that hold the pane firmly yet removably. The method of attachment to the windshield posts also is unusual, the brackets being held by the regular screws of the shield, and having a joint with a spring-adjusted fiber friction washer, enabling the wings to be set at any desired angle.

¶ Dancing on a ship's deck in the Mediterranean Sea, to the strains of an orchestra playing in London, was a feat in which guests on board Marconi's yacht "Electra" recently participated. This floating radio laboratory and its scientific mission recently were described in Popular Mechanics Magazine.

FINEST APARTMENT BUILDING IN THE WORLD

What are said to be the finest apartments in the world have just been completed on Fifth Avenue, New York. The

What is Claimed to Be the World's Finest Apartment Building Is in New York. Each Floor Is an Apartment and Rents for $30,000 a Year. A Driveway under the Building Discharges Passengers on a Private Plaza

builders do not claim that it is the greatest in cost, for it is not very large compared with others along the avenue, but they do claim that it possesses the finest view of the picturesque sailing-boat lake in Central Park, and 162 ft. of southern exposure. This last feature is most unusual for the crowded Fifth Avenue apartment district, while it is the only building of this character having a driveway that goes in under the building and allows motor cars to take on or discharge their passengers in a private plaza.

The finest plumbing and other fittings are used throughout the structure, but the interior decorations are done entirely by the lessees. Under this decorative agreement they are privileged to employ any kind of woods, one of the lessees going so far as to have the doors and panels of an old European castle brought over to harmonize with some medieval-period furniture. There is an apartment to each floor, the largest consisting of 15 rooms, 5 baths, and 6 servants' rooms, with bath, and renting for $30,000 a year. Probably the most unusual thing about this apartment is that the minimum lease is for 10 years. All the leases were signed before the building was completed.

WORKERS' WEEKLY INSPECTION ASSURES THEIR SAFETY

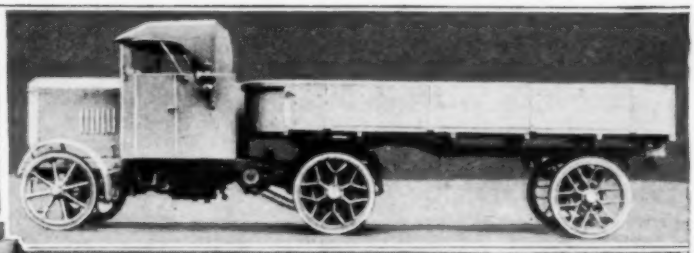
Periodical inspection of the entire plant from top to bottom, by a committee of the foremen, mechanics, and laborers engaged on the construction of a huge rolling-mill extension in Ohio, is the novel means now in use for assuring the safety of all employes. At an appointed time every week, the committee drops its regular tasks and makes its rounds. Its detailed report, with recommendations, is made to a safety committee, which then sees that the changes suggested are properly effected.

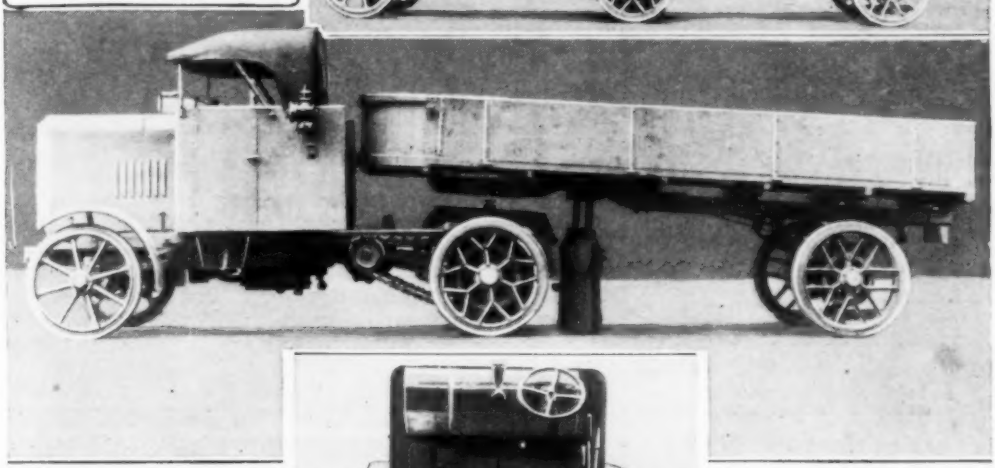
SIX AND EIGHT-WHEELED TRUCKS USED OVERSEAS

The principle that a powered vehicle can haul more than it can carry has been studied both in England and on the Continent recently with the result that two new heavy-duty trucks have appeared—one French, one English. Each consists of a short traction unit and a detachable body, this arrangement resulting in lessened wear on tires and a large increase in capacity. The body of the French vehicle is carried on four wheels of its own, and is linked to the traction unit by a drawbar. The brakes on the body wheels are connected to the controls at the driver's seat, also, thus making it possible for him to check a tendency to skid.

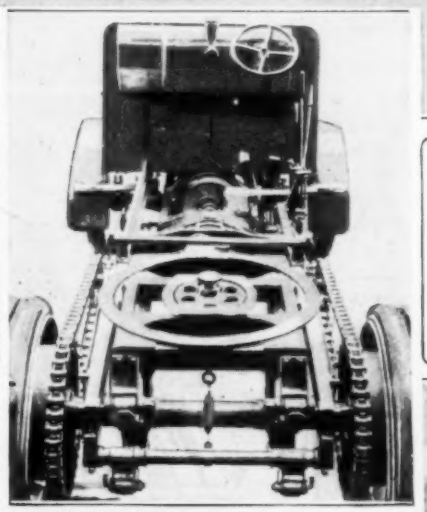
The English truck differs from the French in that the front of the body is carried, not on wheels of its own, but over the power axle of the traction unit. The fifth wheel, or turntable, which receives the weight directly, is itself supported by powerful springs. The proportionately enormous capacity of this truck is indicated by the fact that though it weighs, unloaded, about four tons and a half, it can transport a load of almost eight tons, not including a trailer load of six tons which can be hooked to the rear if desired.

This English Six-Wheeled Truck Weighs, Unloaded, About Four Tons and a Half. It will Transport, in the Body, a Load of Almost Eight Tons, and in Addition will Haul a Trailer Load of Six Tons. No Part of the Mechanism has been Made Particularly Heavy to Make Possible This Performance

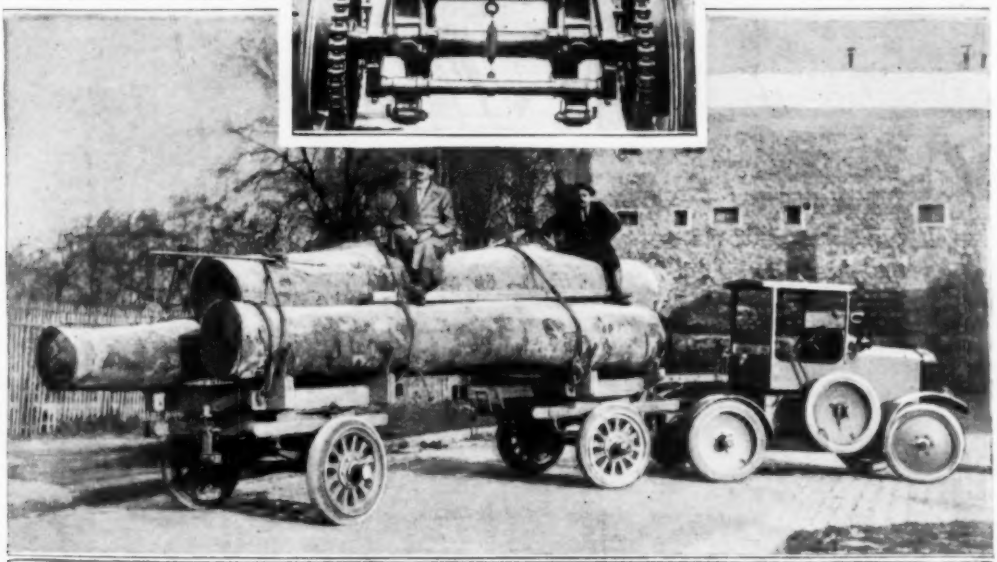




The Body can be Quickly Detached from the Traction Unit of the New English Truck by Simply Jacking Up the Front End, as Illustrated Above. This Feature Adds Considerably to the Value of the Truck by Making Possible the Substitution of Loaded for Unloaded Bodies When Quick Operation Is Essential



The Chassis of the Tractor Unit, as Shown at the Left, Is Surprisingly Light, in View of the Heavy Work Done. The Rear Springs Are Underslung; Separate Springs Support the Fifth Wheel, or Turntable. This New Six-Wheeled Machine Costs No More to Maintain It has been Found, than the Ordinary Truck



The Tractor Unit of the New French Truck is being Used Here to Haul a Special Log-Carrying Body. The Brakes of the Whee's beneath the Ordinary Body are Connected with the Controls at the Driver's Seat, Making It Possible for Him to Check a Tendency to Skid

ABANDONED RAILROAD TRACKS COVERED WITH ASPHALT

A minor railroad, which had discontinued business, discovered that it could not remove at a profit the rails and replace

Because the Rails of a Defunct Railroad could Not be Profitably Salvaged, the Tracks were Covered with Asphalt as Part of the Street

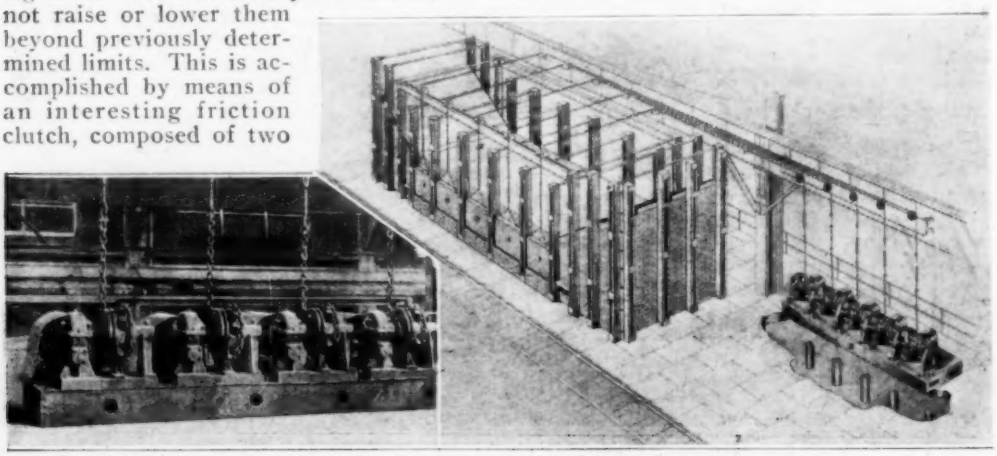
the paving along its right of way through a town. The city did not wish to assume the expense of removing the rails. In the interests of traffic and the municipal finances, it was decided that the rails should be covered with asphalt paving material, making the right of way uniform with the street, removing the railroad as a traffic nuisance, and properly burying the defunct track.

ELECTRIC MACHINE OPERATES DOORS OF FURNACE

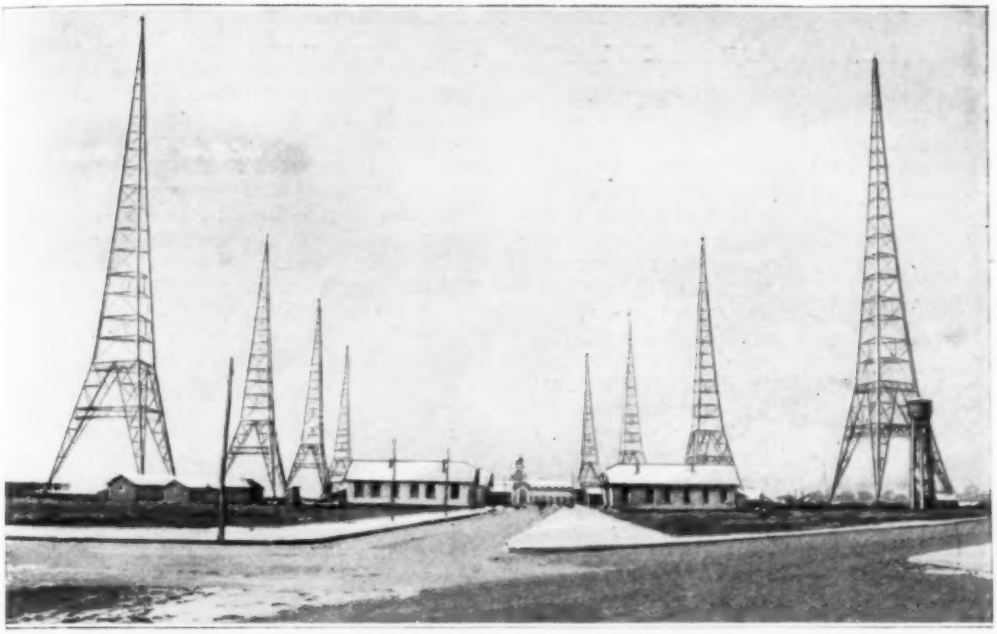
A new electrical apparatus for operating the heavy doors of open-hearth and heating furnaces is noteworthy because it cannot raise or lower them beyond previously determined limits. This is accomplished by means of an interesting friction clutch, composed of two flanges and two sheaves, all of which are mounted on a worm-driven shaft. The two flanges are fixed permanently to the shaft, about one foot apart; the two sheaves are slidably mounted between them. The sheaves make contact by means of sloping lugs; one of the sheaves carries the chain which supports the furnace door, the other carries the chain from which the counterweight hangs. To lower the door, a switch button is pressed, and the motor turns the shaft and raises the counterweight. Meanwhile the weight of the door serves to keep the sheaves apart, thanks to the sloping lugs, and so in steady frictional contact with the flanges. When the door reaches its final position, a stop on one of the sheaves meets a stop on the base casting, so permitting the sheaves to approach each other, and ending the squeezing grip of the two flanges.

THREE GERMAN DEVELOPMENTS OF MOTION-PICTURE INDUSTRY

Progress of the German motion-picture industry has been marked in late months by some interesting developments. Among them is a method of suppressing the flickering of the projected image. It involves a system of mirrors, by means of which the source of light moves, in effect, with the film and at the same speed. Another is the invention of a film—as light and flexible as the picture film itself—upon which the human voice is recorded by the phonograph needle. This phonographic film can be run, it is claimed, in perfect synchronism with the projection machine.



An Electrically Operated Apparatus for Opening and Closing the Doors of Open-Hearth Steel Furnaces: By Means of a Simple Friction Control It Is Impossible to Raise or Lower the Doors beyond Predetermined Limits



RADIO STATION ABANDONED BY U. S. NAVY COMPLETED FOR FRANCE

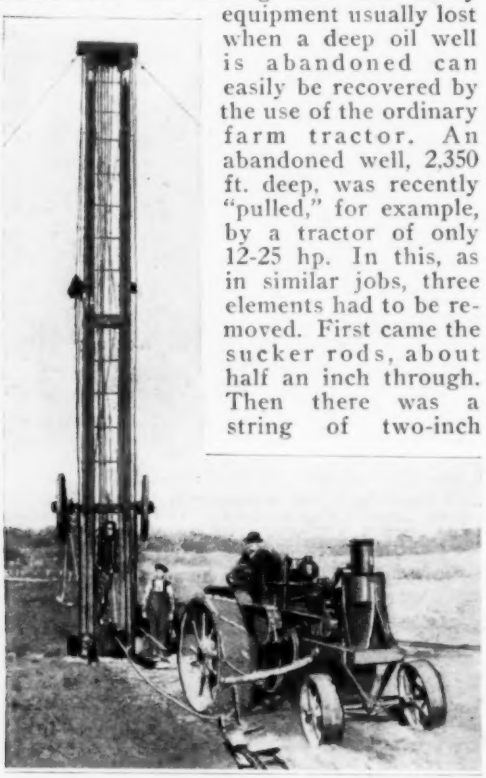
THE Lafayette wireless station at Croix d'Hins, 15 miles from Bordeaux, France, was completed by an American company a few weeks ago for the French government. This monster plant was a war-time project of the United States Navy, and was to have linked America with its expeditionary force. At the signing of the armistice, however, work was stopped. The eight towers, each 825 ft. high, are arranged in two parallel rows, four in each row. It was from this station, incidentally, that the secretary of the U. S. Navy recently received this message: "This is the first wireless message to be heard around the world and marks a milestone in the road of scientific achievement."

COLUMBIA RIVER STERN-WHEELER SUNK BY THE EXPLOSION OF ITS BOILER

THE destruction shown in the photograph was caused by the explosion of a boiler on the "State of Washington," a stern-wheeler, just as it was entering the Columbia River with a large ship-rigged oil barge in tow. The boiler was blown through the deck and high into the air, wrecking the superstructure and damaging the hull to such an extent that the ship later sank in about 50 ft. of water. Members of the crew, who were near by at the time, miraculously escaped with slight injuries. One of the fireroom crew, who was standing in front of the boiler at the time of the accident, although he was blown forward a considerable distance, escaped with only a few burns and bruises.

FARM TRACTOR "PULLS" ABANDONED OIL WELLS

Several oil contractors of the American Southwest are finding that the costly equipment usually lost when a deep oil well is abandoned can easily be recovered by the use of the ordinary farm tractor. An abandoned well, 2,350 ft. deep, was recently "pulled," for example, by a tractor of only 12-25 hp. In this, as in similar jobs, three elements had to be removed. First came the sucker rods, about half an inch through. Then there was a string of two-inch tubing. Last came the many feet of casing which, in this particular job, weighed 13 lb. to the foot, or a total of 30,550 lb. This tremendous weight was lifted bodily by means of a nine-strand block, the tractor traveling hundreds of feet, of course, to raise the casing a score or less.



The Farm Tractor is Seen at Its New Work of "Pulling" Abandoned Oil Wells. This Well Was 2,300 Feet Deep

SURGERY OF PREHISTORIC AGE REVEALED BY SKELETON

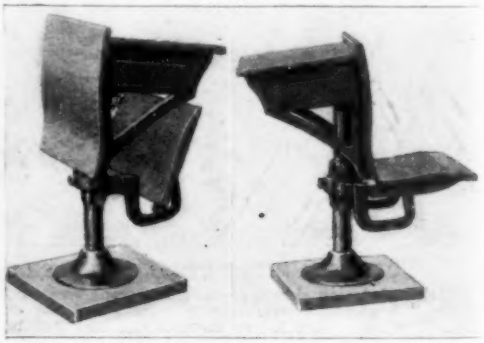
That the use of splints in the treatment of fractures was known to the rude practitioners of prehistoric America is revealed by examination of the skeleton of a young woman recently exhumed in the Pueblo ruins at Aztec, N. M. The left forearm, badly broken in two places, was surrounded by six carefully made splints of wood, with evidence that there had been eight or nine. These strips, about 7 in. long, ½ in. wide, and 3/16 in. thick, were flat on the inner side and curved on the outer, and practically of uniform shape. The bindings, of course, were disintegrated, and the position of the bones made it impossible to judge the skill of the savage surgeon, but the evidence of scientific beginnings, at least, is unmistakable. The unfortunate patient also had suffered a severe fracture of the hip, but that, apparently, was beyond the ability of the primitive healer.

NATIVE HAWAIIANS SOON TO BECOME EXTINCT

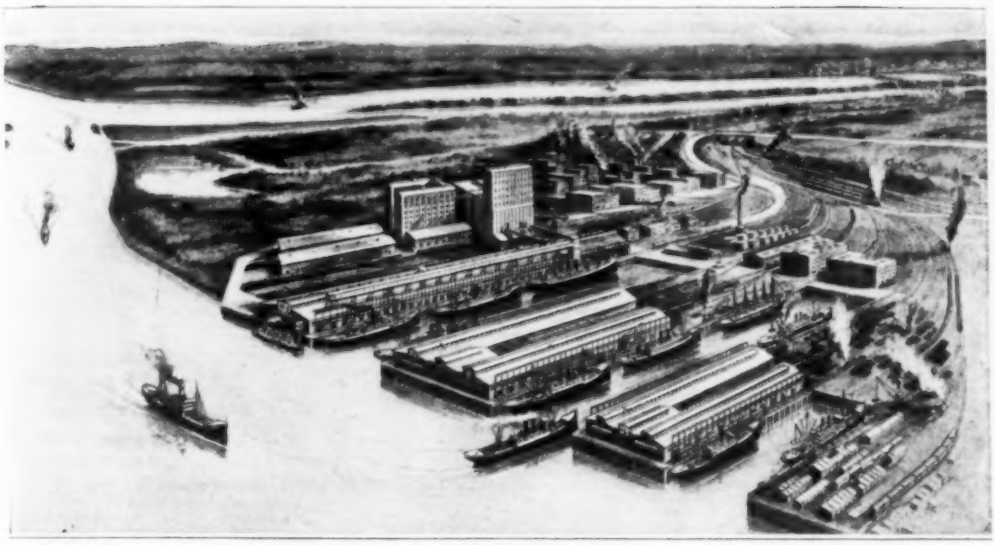
Native Hawaiians are facing extinction and, if the present ratio of births and deaths is maintained, the remaining life of the race will be only about 75 years. At present there are approximately 25,000 natives of pure blood in the islands, and reports for past years show their number to be rapidly decreasing. In marked contrast to the statistics which have led to the belief that the Hawaiians are a "dying" race, are those dealing with the inhabitants of mixed blood.

NEW SEAT AND DESK CARRIED ON THREADED PEDESTAL

A newly patented desk and chair for schoolroom use is mounted compactly on a steel pedestal, and is adjustable in every way. This adjustability is secured by threading the steel upright of the pedestal, and supporting the seat from it by means of a threaded sleeve. As a result, the seat can be turned through a complete circle, or by turning it many times, can be lowered or raised to suit the stature of the pupil. The angle-iron frame of the desk pivots about the top of the upright. The seat can be turned through a half circle, and then folded to give additional room between the seats.



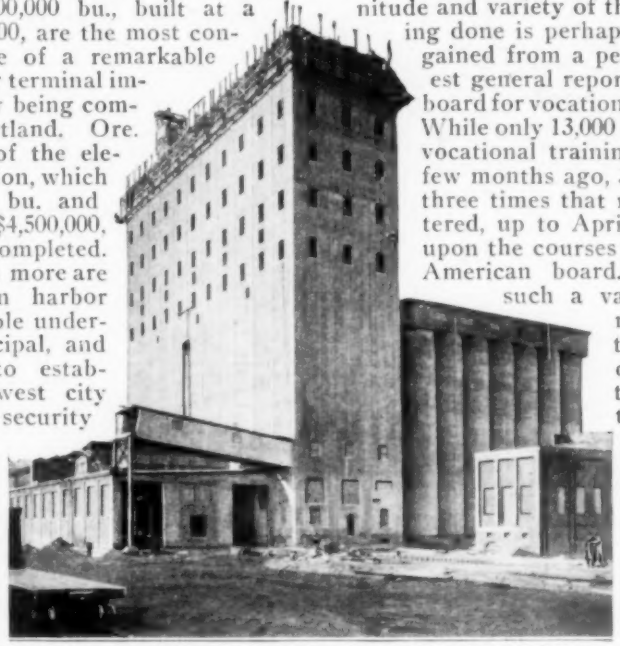
This New School Seat and Desk Is Adjustable to the Stature of the Pupil



An Aerial View of the Remarkable System of Harbor-Terminal Improvements Now being Completed at Portland, Oregon, with the Giant Elevators in the Center

IMPROVE WEST-COAST HARBOR WITH GIANT ELEVATORS

Giant new grain elevators with a total capacity of 2,500,000 bu., built at a cost of $11,000,000, are the most conspicuous feature of a remarkable system of harbor terminal improvements now being completed at Portland, Ore. The first unit of the elevator construction, which holds 1,000,000 bu. and has cost so far $4,500,000, is practically completed. Several millions more are being spent on harbor work. The whole undertaking is municipal, and is calculated to establish the northwest city with greater security than ever in its leadership of the region as a manufacturer of flour and as a central wheat-shipping port.



The First Unit, Now Practically Completed, of Portland's New Grain-Elevator Equipment, Costing $4,500,000 and Holding 1,000,000 Bushels

¶A new rubber playing ball has been patented that can be inflated and deflated at will. The ball is provided with a special check valve which the pressure of the inside air holds shut. The air is released by pushing a rod or pencil against the valve.

VOCATIONAL TRAINING MAKES SURPRISING PROGRESS

An impression of the astounding magnitude and variety of the work now being done is perhaps the first to be gained from a perusal of the latest general report of the Federal board for vocational rehabilitation. While only 13,000 men were taking vocational training in England a few months ago, 35,000, or almost three times that number, had entered, up to April 1 of this year, upon the courses provided by the American board. The care of such a vast number was made possible by the coöperation of 1,300 educational institutions, and some 2,600 industrial, commercial, agricultural, and other agencies.

The most interesting phase of this varied work, as gleaned from the report, is being done at the Red Cross Institute for the Blind, in Baltimore, Md. Here 85 soldiers, sailors, and marines are being refitted for life. During the first months the blind veteran is taught to read and

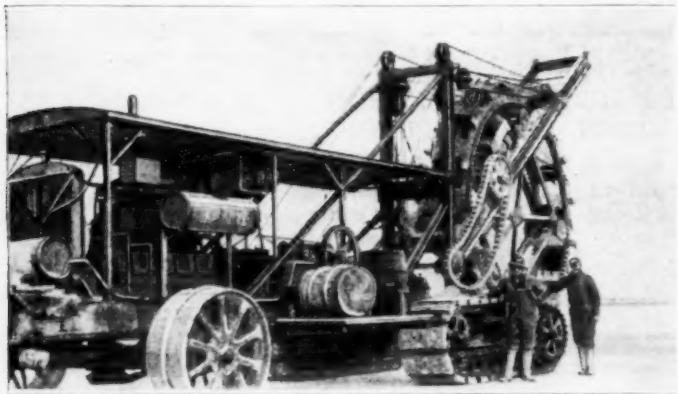
write the revised Braille system, to operate a typewriter by the touch system, and to handle tools in the manual-training department. While these activities are giving him self-confidence, dancing, concerts, games, and similar recreations help him to regain his other contacts with society. Finally comes the formal vocational education which prepares some for shopkeeping, others for cigarmaking, tire vulcanizing, and a dozen other trades.

Disabled veterans in the numerous tuberculosis sanitariums are also being trained. At the present time an educational director and teachers are stationed at eight of these institutions, helping to prepare the less afflicted men to make valid choices of occupation. Another enheartening feature of the report is the statement that a summer vacation camp is to be established at Bear Mountain, on the Hudson River.

MODERN MACHINERY WORKS UTAH SALT FIELDS

By GEORGE F. PAUL

HARVESTING salt with modern machinery is proving a revelation in the immense salt fields of western Utah. Here, within a few miles of the Nevada-Utah boundary, is a vast salt deposit that runs from 2 to 15 ft. in thickness and covers an area of more than 500 square miles. A salt-harvesting machine is used to loosen the salt; it operates on much the same principles as an ice plow. This machine also gathers the salt into a bucket conveyor, which in turn elevates it into a screen and then dumps it into five-ton wagons.



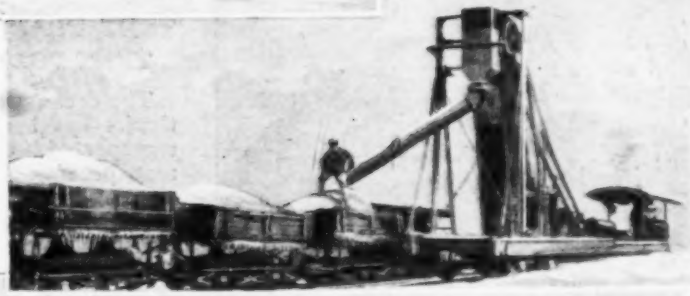
The Brine Canals are No Longer Dug with Pick and Shovel, but by This Great Trench-Digging Machine. The Internal-Combustion Engine is Carried on Two Wheels; Two Endless Treads Carry the Revolving Shovels

The wagons convey the salt to a small industrial railway. Here it is dumped on the ground and allowed to dry thoroughly in the sun. After it has been properly dried, bucket loaders pick it up and load it into small cars that convey it to the refining mills. One of the largest mills is devoted to the making of table salt. Most of the salt, how-

In This View of the Vats One of the Machines can be Discerned in the Middle Distance. In the Background, Silhouetted against the Darker Masses of the Mountains, Are the Mills and Smaller Buildings. In the Mills Modern Methods Are the Rule, Just as in the Vats and Fields

In Striking Contrast to the Primitive Methods of Salt Making Still Practiced in Many Foreign Lands Are the Up-to-the-Minute Activities of the Mills, like the One Pictured Above, Located at the Extensive Salt Fields of Western Utah. The Fields Cover an Area of More than 500 Square Miles

An Industrial Railway Extends to All Parts of the Typical Salt-Making Establishment in Western Utah. Above, for Example, Salt is being Dumped from the Cars upon a Storage Pile. At the Right, the Cars are Seen beside the Harvesting Machine That Loosens the Salt, Picks It Up in a Bucket Conveyor, Screens It, and Dumps It, Finally, into the Cars



The Salt Maker of Western Utah Employs Modern Machinery for Every Operation. Here a Loader of Interesting Type is being Used to Fill the Cars Which Carry the Salt from the Storage Pile to the Mill. The Conveyor Dumps the Salt into a Little Car, Which, When Filled, is Pulled to the End of the Boom and Tipped

ever, is sold for stock feed, and a considerable part is shipped to smelters for use as fluxing. The use of modern machinery and up-to-date methods has resulted in a remarkable increase in the production of salt in Utah.

RUSSIAN RAILWAY SWITCHMEN BLOW HORNS FOR SIGNALS

Officials of the Trans-Siberian Railway evidently believe that the ear has advantages over the eye in the important business of receiving signals. The switchmen on that long line across the vast plains of Asiatic Russia are provided with horns, small of size but vigorous of voice, and on these they toot a code that serves as an effective substitute for the usual waving of arms and swinging of lanterns for the guidance of the locomotive drivers.

PHOTO BY HARRY BEARDSLEY

Russian Switchmen of the Trans-Siberian Railway, with the Horns They Use to Signal the Engineers

BURN WESTERN DATE ORCHARDS TO ERADICATE SCALE

Only charred and blackened trunks, denuded of their last vestige of greenery, now stand to mark the location of the three oldest and largest orchards of date palms in the United States. All of these orchards were grown from imported trees. One, at Yuma, Ariz., yielded a $7,000 crop last season. Their burning, far from being accidental, was deliberately done, by gasoline torches in the hands of state experts, as a heroic cure—the only one known—for the scale disease known to scientists as *Parlatoria blanchardii*. This minute insect parasite thrives at the base of the palm leaves, as well as on other green parts of the tree, multiplying rapidly and apparently immune to all sprays and fumigation. Cutting away the green growth and charring the trunk and branches eradicates the pest, and, contrary to the superficial impression, does the trees no injury, the foliage returning in a year to its full luxuriance.

OAK GALLS THAT JUMP HAVE WORM FOR MOTIVE POWER

Certain galls of the oak tree that display a mysterious ability to "jump," or at least make sudden movements, have long been the subject of unscientific curiosity. It is explained that their motive power is, as in the case of the famous Mexican "jumping bean," a tiny worm, the larva of a gallfly, whose quick turns disturb the gall's center of gravity.

TENT TRANSPORTED IN POCKET TENT POLE CARRIED AS CANE

The dream of many a pack-weary vacationist has been a tent which could be transported in the coat pocket, with a tent pole which could be carried as a walking stick. And this seemingly impossible convenience has now been realized by a manufacturer of London, England. When erected, the tent is pyramidal in form and about four feet high. The fabric is tough, but extremely thin, like balloon fabric. The tent pole is hinged in the middle.

WIDE WORLD PHOTO

The Finely Woven Fabric of This Tent can be Carried in the Coat Pocket Folded. The Pole Becomes a Walking Stick

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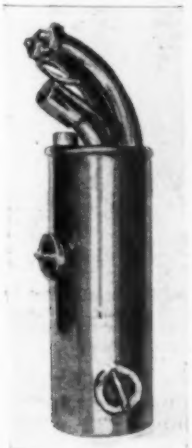
This Team of Camels Is the Property of a Circus in Winterquarters, and is Used Instead of Mules, on Account of the High Price of These Animals, for Hauling Hay

CAMELS USED FOR HAULING BY WINTERING CIRCUSES

Down South, where most of the circuses go into winter quarters, a team of camels is used to haul hay for the animals. The camels are used for draft purposes, both to keep them in good physical condition and because the high price of mules is almost prohibitive. It is claimed for the camels that they can haul as much hay and do as much work as a team of mules.

ALCOHOL TORCH GIVES HOT FLAME WITHOUT BLOWING



By means of a superheating tube which delivers perfectly dry alcohol gas along with the proper amount of air to the burner, a self-blowing alcohol torch has been developed that will produce a temperature sufficient to fuse light copper wire. The torch will burn from three to four hours with a single filling of denatured alcohol. It can be tilted to any position or angle.

THREE-WHEELED TRUCK EASES MOVING OF HEAVY LOADS

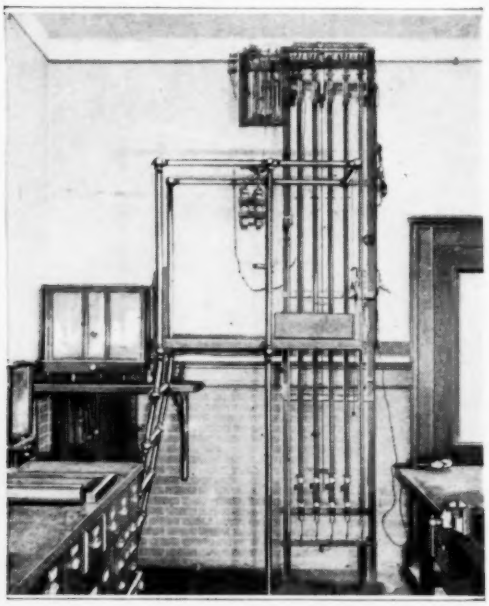
For the transportation of heavy loads on a hand truck a third-wheel attachment has been brought out. The attachment

A Third-Wheel Attachment Which is Easily Fitted to an Ordinary Hand Truck Makes It Possible for a Single Workman to Handle Heavy Loads Unaided

can be applied to any standard hand truck. The third wheel bears practically the entire weight of the load which is transported in the usual manner. Using this device on an ordinary truck is claimed to eliminate overbalancing of the load and to permit one man to handle a heavy load without assistance. The body of the truck is held at an angle by a support on the attachment.

UNUSUAL APPARATUS MEASURES PRESSURE IN LABORATORY

For investigating the pressure properties of ammonia, sulphur dioxide, and other refrigerating materials, the Bureau



The High Pressures were Balanced by Mercury in Five Eight-Foot Tubes, Placed Side by Side, Rather Than in a Single Tube of 40 Feet

of Standards recently constructed an interesting high-pressure manometer. It was desired to measure pressures up to 225 lb. a square inch by balancing them against a column of mercury. If this column had been used in the ordinary way—in a single vertical tube—it would have been from 35 to 40 ft. high. Consequently the tube was arranged in five 8-ft. lengths, placed side by side, with the top of one connected to the bottom of the next by means of smaller tubes filled with liquid. The effect of this last was deducted, of course, in making calculations.

FIRST MARINE EXPOSITION IN THE UNITED STATES

That the people of the country are taking a keen interest in making American independence on the sea permanent and secure was demonstrated recently in New York City, when the first merchant-marine exposition ever held in the United States was opened to the public. Three floors of a large building were given over to exhibits of practically every branch of the shipbuilding and other maritime industries, while three government bodies—the Navy, the Department of Commerce, and the Shipping Board—took the opportunity to show what the government is doing to build up the American merchant marine.

A number of new devices to bring ship construction to greater efficiency were exhibited, while models of steamers of all types were also displayed. The numerous booths of American manufacturers showed that there is no part of a ship, from a compass to an anchor, which cannot be "made in America." Specimens of what is being constructed by maritime industries were also shown.

From information given out at the exhibition it appears that the United States now possesses 9,463,003 dead-weight tons of steel ships, 1,844,400 tons of wooden ships, 63,000 tons of composite ships, and 13,500 tons of concrete ships, a total tonnage of 11,383,903 dead-weight, exclusive of the 3,087,428 tons to be completed in this year.

ROADSIDE SIGNPOST WARNS MOTORISTS OF SPEED TRAP

Like a good sportsman out for pheasant or quail, the sheriff of Allen County, Ind., believes in giving his game a sporting chance. Hence, on entering a tempting stretch of concrete highway near Fort Wayne, motorists observe a signpost which bears the warning "Speed Trap. Beware. Sheriff Allen Co." Most accept gratefully the advice implied; the few who incite pursuit by the motorcycle policeman on duty find it difficult, when

The Sign by the Roadside Tells the Motorist What to Expect if He Speeds on This Tempting Concrete Stretch of Indiana Highway. It Reads: "Speed Trap. Beware. Sheriff Allen County"

the heavy foot of the law descends upon the running board, to assume an expression of astonished innocence. They can scarcely plead ignorance of the law.

SALMON BESTS BALDHEADED EAGLE IN BATTLE

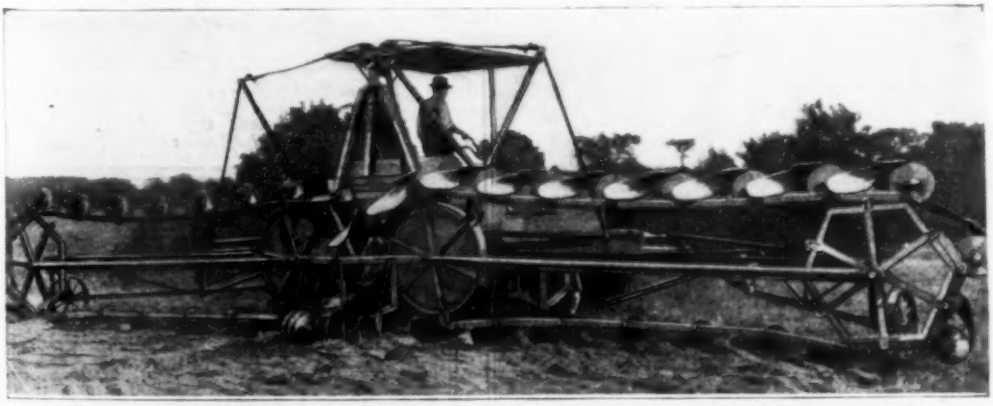
Recently the crew of a sailing ship entering Puget Sound observed a terrific fight between a baldheaded American eagle and a huge spring salmon in the Straits of Juan de Fuca, a fight in which the salmon bested the eagle and almost drowned him. The eagle, lying exhausted in the water, was picked up by the ship's crew and taken to Seattle, where it was turned over to the city zoo.

The crew of the ship was watching the antics of a school of salmon pressing ahead of the boat near the surface of the water, when three large eagles swooped down out of the sky and hovered above the fish. Suddenly a big spring salmon leaped from the water. The largest of the eagles dipped like a flash and caught the fish in mid-air.

With the eagle's talons buried in its back, the salmon struck the water and, with a mighty splash, made a nose dive. Bird and fish sank from sight. The other eagles darted about overhead, screaming shrilly. Three times the attacking eagle and its prize appeared on the surface of the water and again disappeared. Finally the eagle came up alone and floated on its side on the water—exhausted, helpless.

The ship, which had come up behind the combatants, hove alongside the eagle, and a sailor rescued it with a boat hook. The bird did not struggle as it was pulled aboard, but the instant its feet touched the deck, it began to fight. The combined strength of four men was required to subdue the eagle and stow it away in a box. A few minutes later the victorious salmon, with crimson flowing from its mutilated back, reappeared on the surface of the water and was gaffed. It was found to weigh 20 pounds.

Victor and Vanquished are Seen aboard the Sailing Ship Which Picked Them Up on the Conclusion of the Strange Combat. Recovered from Its Exhaustion, the Eagle Perches on the Spar to Which It is Tied. The 20-Pound Fish Is Dead



SHARES OF NEW TRACTOR PLOW MOVE TRANSVERSELY ON ENDLESS CONVEYORS

THE evolution of man's machines, a subject scarcely less absorbing than the evolution of man himself, cannot be epitomized more strikingly than by comparing the plow of ancient Egypt with the elaborate mechanism pictured here. The Egyptian plow was formed of a wooden wedge, a handle, and a beam to which men or oxen were hitched. This newest plow, designed and constructed by an inventor of Montreal, Que., is a unit affair, consisting of a tractor and two transverse arms fixed permanently to the rear. Back and forth on these arms, and driven by the tractor engine, run the plowshares. All controls are located at the driver's seat. Land tilled by this machine is distinguished by an unmistakable herringbone appearance, in consequence of the combined forward movement of the tractor and the sidewise travel of the shares.

CIVIC FEATURES THAT PROMOTE THE COMFORT

Visitors New to Los Angeles, California, Are Unanimous in Praise of This New Type of Street Sign. It Displays the Block Numbers as Well as the Names

This Garage at the Coast-Resort Town of East Newport, California, Resembles a Hotel in That the Motorist is Given the Key to an Individual Stall and can Use the Stall as His Own, Thereafter, So Long as He Pays the Rent

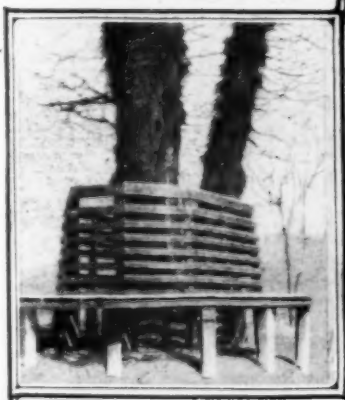
This Stone Culvert at the Common Corner of Four Townships, in Allen County, Indiana, is Called "Four Presidents' Corner," a Name Almost as Long as the Structure. The Four So Memorialized Are Jackson, Jefferson, Monroe, and Madison

From This Tower at the River's Edge the Danger Signal is Given When High Water Threatens the Grounds of the State Insane Asylum at Reno, Nevada

More than 100 of These Collapsible Picnic Tables have been Supplied by the Federal Forest Service for Use in the Eagle Creek Camp Grounds of Oregon. One of the Tables is Shown in the Background as Disassembled for Winter Storage. The Top Is Three Feet Wide and Twice as Long

Shallow Vaults with Iron Doors are Placed beside the Curb before Many Residences in Pasadena, California, in Order That Garbage Cans may be Concealed Pending Collection by the Municipal Wagons

The First Courthouse in Macon County, Illinois, Is, Still in Good Condition, as the Topmost Photograph Suggests. The Picture on the Wall of the Interior, Below, Recalls the Tradition That the Place was Often Visited by "Abe" Lincoln, Lawyer



The High Back of This Circular Bench in Eden Park, Cincinnati, Shields the Occupants from Sharp Twigs, and Protects the Bark Adjacent to a Recent Filling of Concrete

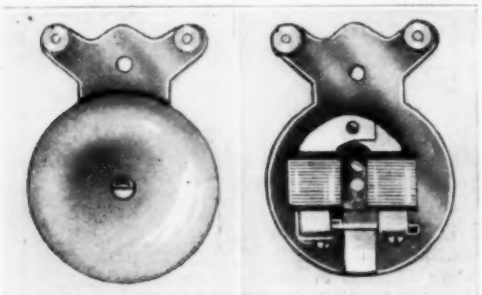
In Place of the Formal Gardens with Which the Grounds of the Small Railroad Stations are So Often Decorated, a Gigantic Sundial is Located near the Building at Dodge City, Kansas. The "Style" Is a Pole About 25 Feet Long; This Casts Its Shadow over a Dial Marked by Whitewashed Stones

ORDINARY STREET LIGHTS ARE ROADSIDE DANGER SIGNALS

The ordinary street lights in a fashionable suburb of Detroit, Mich., are now being used as roadside danger signals in place of the signboards posted, and usually ignored, heretofore. Conversion of a light at a dangerous curve or crossing into a warning signal is simply a matter of painting a red circle, 8 in. in diameter, on the proper side of the 16-in. globe. As these globes are carried by ornamental iron poles, 12 ft. high, the red disks can be seen clearly both in the daytime and when the current is on, and have proved more efficient than the signboards.

COMPACT ELECTRIC BELL HAS MAGNET UNDER GONG

In the ordinary form of electric bell, the space underneath the gong is wasted, and an extended base and a separate cover are needed to accommodate the electromagnet and its armature and circuit breaker. A form of bell designed by an eastern inventor has a horseshoe-shaped magnet on a circular base, the working parts being mounted on the ends of the poles. The gong, removable by unscrewing, serves as a cover for the whole, only enough of the base projecting to carry the binding posts. The construction is declared to be much more economical than the usual style.



Left: The Normal Appearance of the Bell. Right: The Gong Removed, Revealing the Working Parts

STUDY MOLDS AND BACTERIA TO STOP SUGAR WASTE

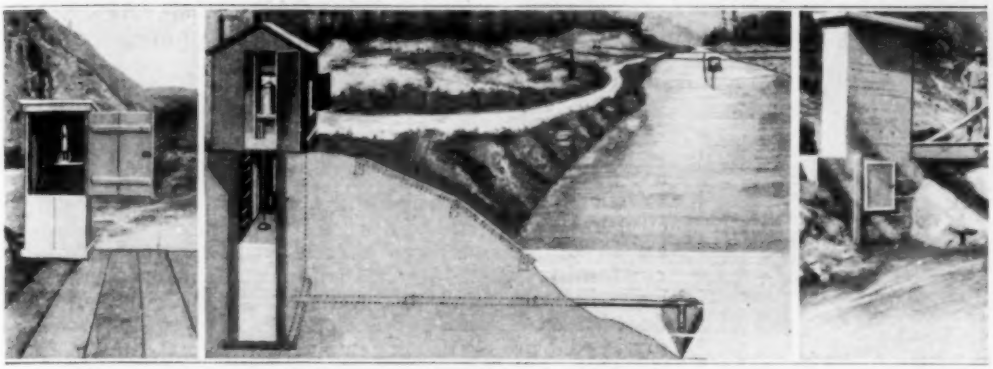
Rapidly multiplying molds and bacteria with a predilection for sucrose, the sweetening element of sugar, are estimated to destroy one per cent, or about 70,000,000 lb., of the Cuban sugar crop each year. The germs gain access through the water of the washing process, the air used in drying, or the moisture absorbed in storage. Two scientists of a southern experiment station, specializing in sugar, have found that washing with superheated steam instead of water not only prevents infection, but effectually destroys any molds or bacteria present. They have also prepared a chart for comparison with the analysis of stored sugar, indicating what portion of a given lot may be kept for a longer period, and what should be used first.

FACTORY BUILT AROUND OLD HOUSE ON CORNER

In negotiating for the purchase of a corner lot in Pueblo, Colo., a tent and awning company found that all the land could be bought except for a 25 by 25 ft. area on the corner itself. This was occupied by an old four-story rooming house which the owner refused to part with. As a result the company's factory was built around the old structure, and now is usually mistaken for two buildings by those who have never inspected the interior.

This View does Not Represent One Building but a New Factory Built around the old Corner House Which the Owner Refused to Sell

¶ Wool growers in North Dakota are pooling this year's clip at Fargo, making shipments through their associations, while the state association stores, grades, and sells the wool direct to the mills. It is expected that more than a million pounds of wool will be handled this season in this manner.



Two of the Little Sheds Built for the Work of Recording the Rise and Fall of California Streams are Seen at Right and Left. The Cistern, with Its Intake, Float, and Recording Drum, is Seen in the Cross-Sectional View in the Middle. In the Background Is the Suspension Cable with Its Car for the Inspector

RISE AND FALL OF STREAMS RECORDED AUTOMATICALLY

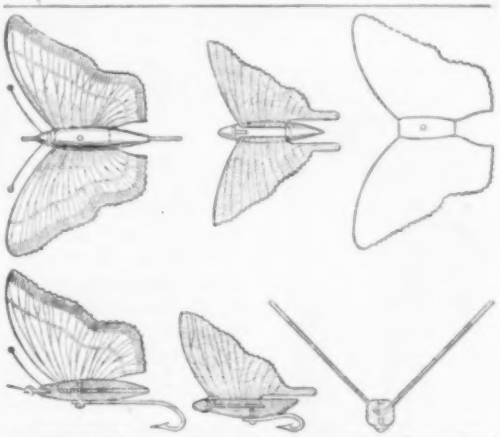
By means of self-registering stations housed in small concrete sheds, the state water commission is now studying the habits of the streams of California for guidance in flood-control work, and in passing upon petitions to divert water for irrigation purposes. Beneath each of these sheds is a cistern connected through a short length of pipe with the stream bed, in order that stream level and cistern level may be the same. From a float in the cistern a rod ascends to the interior of the shed, where it moves a pen against a clockwork-driven recording drum. From weekly or monthly inspections of the chart made in this way, the commission learns what the water level has been from day to day. No automatic mechanism of this sort is used, however, to ascertain the speed of the stream. Instead, as variations from normal are usually small, the speed is measured by the inspector himself at the time of his visit. This he does by conveying himself out over the middle of the stream by means of a car slung from a stout cable. Here he lowers his meter.

FIND HAWKER'S UNDERCARRIAGE LOST IN HISTORIC FLIGHT

Fishermen operating along the coast of Newfoundland, southwest of Cape Race, picked up, a short time ago, a curious steel frame with wheels mounted on it, and brought it into port. It was identified as the undercarriage of Harry G. Hawker's airplane, cut loose by that daring adventurer when he started on his sensational flight across the ocean on May 18, 1919. The lost gear, thus strangely recovered 200 miles from its point of disappearance, and more than a year later, has been presented to the public museum of the city of St. John's.

IMITATION BUTTERFLIES ARE LATEST ANGLING LURES

That recent development of the fly fisherman's fancy known as a "bass bug," which heretofore has resembled nothing in particular, now has assumed the form of a full-size butterfly with changeable wings, thanks to a Mississippi inventor. The floating body carries the hook, as usual. To it the separate wings, made of celluloid or varnished silk, may be quickly attached. In place of the customary fly book, the angler simply carries a little pad of wings, in all the color combinations desired.

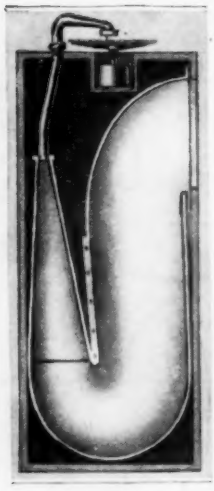


Side, Top, and End Views of Some Forms of the Butterfly Angling Lure with Interchangeable Wings, with Details Showing Construction. The Wings are Made of Celluloid or Varnished Silk

PERFORATED PIPE'S CASCADE HELPS WINDOW WASHER

Store windows are still washed, as a rule, in the most primitive fashion, with a bucket of water. Up in a northern Wisconsin city, however, an inventive confectioner has introduced a modernized and ingenious system. Along the top edge of each pane, outside and in, he has installed a length of perforated pipe, connected to the water supply. When the valve is turned on, a sheet of clean water flows down the window glass, and a few strokes with a brush finish the whole washing in about four minutes.

CABINET CONTAINS LONG HORN OF PHONOGRAPH



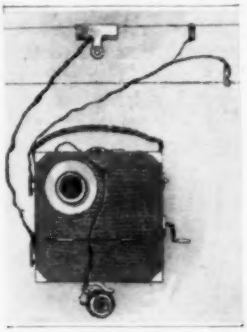
For increasing the sonority of the phonograph an American inventor has recently devised a long, curved horn which suggests the big bass instruments of the orchestra. It is contained entirely within the cabinet, and consists, as seen in the illustration, of a short lead pipe, or conduit, a megaphone of rectangular cross section, and several diaphragms. As these are flat before insertion, and are sprung into position, they do not touch the walls of the cabinet except for the necessary areas of contact.

PURE RED CADMIUM-VAPOR ARC ATTAINED BY SCIENTISTS

Vapor of the metal cadmium, in an electric arc, gives a monochromatic red light that is highly valuable for scientific work. The pure cadmium, however, always breaks the quartz tube of the lamp in solidifying when it cools. Scientists of the Bureau of Standards have now discovered that a small percentage of the rare metal gallium, alloyed with the cadmium, softens it so that it does not adhere to the quartz. The spectrum of the gallium remains invisible at the usual arc temperatures, resulting in a pure cadmium spectrum. The alloy is distilled by heat into the lamp tube from another tube, which is then sealed off under vacuum.

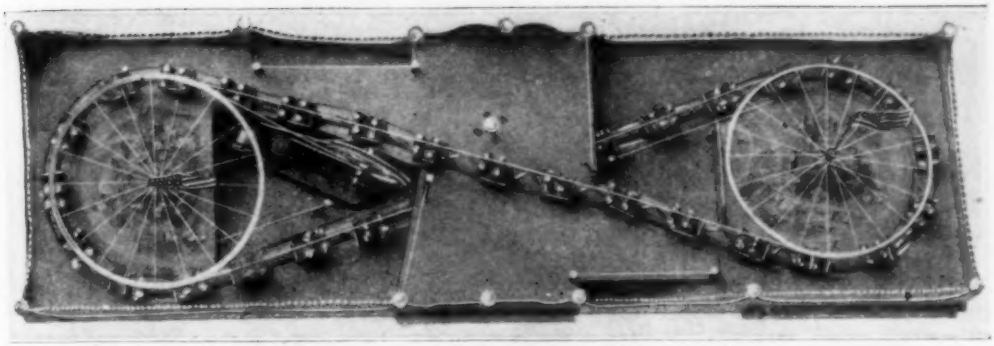
SIMPLE TELEPHONE TEST SET LOCATES TROUBLE ON LINE

Trouble on a telephone line, whether from crossed, grounded, or open wires, is easily detected and located with a form of portable testing set now marketed by a Kansas concern. A magneto generator in the test box is connected to the line wires by a pair of clips, and a small induction coil, connected to a telephone receiver, is hung on one of the wires at another point. When current from the magneto passes through the defective line, a buzzing sound is heard, its loudness indicating the distance to the fault. In testing for open wires, the coil is kept in its place in the box. A transmitter for talking and a small dry battery are included in the equipment.



MECHANICAL WINDOW DISPLAY HAS QUEER MOVEMENTS

Movement, especially of an unusual nature, is a prime attraction in a display window, and a Michigan inventor takes advantage of that fact in a new mechanical advertiser. A cable crossed to form a figure "8" runs on a pair of horizontal wheels, and to it are fastened 32 little cars, in which samples of goods may be

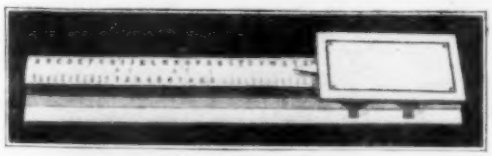


Mechanical Window Display Has Queer Movements: The Little Cars on the Crossed Cable are Guided by a Serpentine Rail Underneath, and Their Course Changed by Other Wheels, Making an Odd Effect

placed. A sinuously shaped rail beneath the cars guides them in a serpentine course, whose level is changed by another wheel arrangement. Decorations and lights add to the odd effect.

NEW SPIRIT BOARD SHAPED LIKE WOODEN RULER

The activity to which the spooks of spiritland have been aroused by the recent popularity of the "planchette" is now to be further increased, it may be assumed, as a result of the introduction of a new board. The base of this apparatus is not the familiar rectangular surface, but a long, rulerlike strip of wood, along the two edges of which are printed the letters, numerals, months of the year, and so on. The work of the heart-shaped table is done by a small platform which

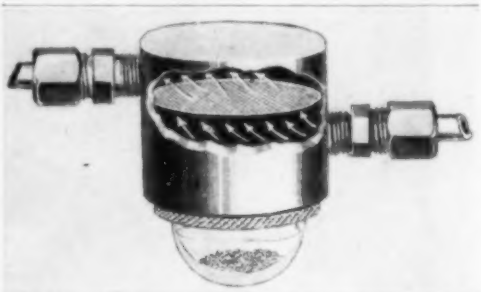


At the Right of the New-Style Spirit Board Is the Platform and Pointer Which Spell Out the Messages from the Spirit World

moves on four wheels and spells the sentences by means of a pointer.

GASOLINE-PIPE ATTACHMENT PURIFIES AUTO FUEL

Small quantities of water and dirt are occasionally found in the best of gasoline, much to the detriment of automobile efficiency. Motorists may now obtain a little attachment to be inserted in the fuel pipe line, which removes these foreign substances and delivers pure gasoline to the engine. It consists of an aluminum and brass cylinder containing a horizontal screen, through which the fuel passes



The Gasoline-Pipe Attachment Broken Away to Show the Screen, While the Refuse is Seen in the Bottom Cup

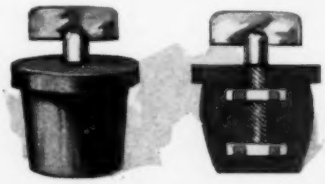
upward. At the bottom is a glass cup in which the refuse collects. The cup is readily removed for cleaning.

SPECIAL FOUNTAIN BRUSH CLEANS TYPEWRITERS

A long-handled fountain brush designed solely for cleaning typewriters is now being put out, stenographers will be interested to know, by an American manufacturer of similar utensils for the printer, tailor, bootblack, and others who frequently use a brush to apply liquids. The typewriter brush functions much like a fountain pen, the gasoline or other liquid being drawn to the working head from the hollow handle, and resembles the general utility brush of the illustration except that the handle is longer.

SOME NOVEL AND LITTLE-KNOWN ACCESSORIES

An Office Worker's Cuff, Made of Celluloid, with Brass Clips for a Rubber-Band Fastener



A Rubber Bottle Stopper, Tightened or Loosened by Turning the Handle

Fire Extinguishers Usually Are Ugly, but This One Is Ornamental Enough for Any Home

Needles with Both Ends Notched for Knitting "Around and Around," and Rubber Stops for Ordinary Work

The Spool of Thread Is the Least of the Sewer's Troubles When It is Attached to the Dress Front by a Convenient Little Patented Holder

An English Picnic Mattress, Fancily Covered, and Foldable for Carrying

A Little Ice-Cream Freezer That Works like a Churn, with a Metal Dasher and Openings at Each End

A Wardrobe Suitcase That Slips under a Pullman Seat, Logical Companion of the Modern Tourist's Trunk

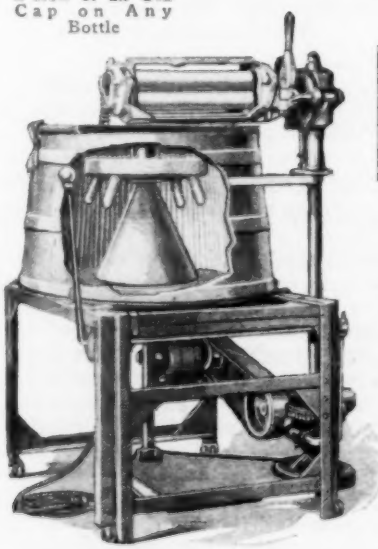
The Adjustable Mirror, the Two Powder-Puff Pockets, and the Extra Compartment Distinguish This Vanity Case

A Refillable Powder Puff, Its Opening Sealed by an Ivory Slide

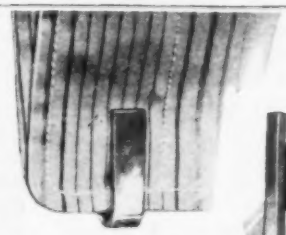
Mere Pressure on the Handle Puts a New or an Old Cap on Any Bottle

A Trunk with an Ironing-Board Attachment, Rigidly Supported by a Metal Leg, will be Appreciated by All Feminine and Some Masculine Travelers

The Clamp Base Makes the Lamp Portable in the True Sense, for It is Readily Fastened Wherever It is Wanted

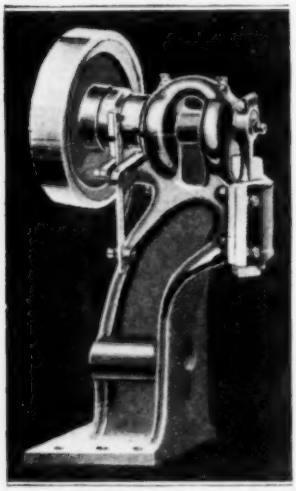


The Reciprocating Cone in the Center of the Latest Washing Machine Keeps the Clothes from Massing Together, and Forces the Hot Suds through Them



The Cuff Link has Become a Cuff Clasp, Hinged at the "U," with a Tongue That Clips through the Buttonhole

LIGHT HORN PRESS FOR BENCH SPEEDS UP SMALL WORK



In a shop where much assembling of small parts is done, a light bench press with a horn instead of a bedplate finds many uses. Such a press, weighing but 130 lb., and standing 26 in. high, has now been put on the market. The hole for the horn, or arbor, is 1 9/16 in., the ram, which is of cast steel, is 1 3/8 in. square, the stroke may be 3/4, 1 1/4, or 1 3/4 in., and the adjustment is 1/2 in. An operating speed of 300 r.p.m. assures a high rate of production.

POCKET ELECTRICAL TESTER FINDS TROUBLE AT ONCE

Not much larger than a fountain pen, and as easily carried in the pocket, a new electrical testing instrument now manufactured in Nebraska serves four distinct purposes. Used as an exploring coil for locating faults in electric wiring or machinery, it is extremely sensitive and accurate, and, giving visual indication, is not affected by noise. It acts also as a delicate galvanometer, and may be used as a polarity indicator, a frequency indicator, and an alternating-current detector, as is the microphone tester.

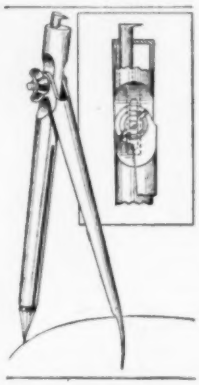
¶An automobile disk wheel which has recently made its appearance is built of thin slices of wood glued together under heavy pressure. As the many laminations are so disposed that the grain of each runs in a direction different from that of the next, the result is a resistant disk that will not crack or warp.

AERIAL COURSE AROUND WORLD MAPPED OUT FOR DERBY

Preparations for the coming aerial Derby around the world have now progressed to the point of mapping out the course to be followed, an arduous task just completed by a joint commission of two American societies. Starting west from New York, the route planned goes by way of Seattle, Yokohama, Shanghai, Bangkok, Karachi, Calcutta, Delhi, Bagdad, Rome, Ireland, London, Newfoundland, and back to New York, a total of 22,207 miles. Before the derby, which is as yet undated, a 10-passenger plane will make a test flight from London to New York, by way of Tokyo and Seattle.

COMPASS, MARKER, AND GAUGE COMBINED IN ONE TOOL

Carpenters, and other mechanics who use various marking and gauging tools in their work, will be interested in a new combination instrument devised by a Texas man. Of the size and style of an ordinary compass, it carries in its head a sliding pin, which, when extended, serves as a marking gauge for any of the several uses of such a tool. The invention thus combines a gauge, a butt gauge, a pencil holder, a scriber, a scratchawl, a compass, and a pair of dividers in one pocket instrument scarcely more bulky than a common pencil.



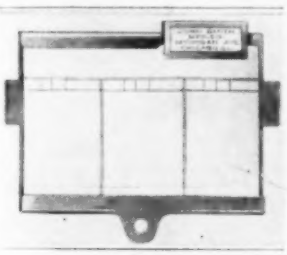
ALCOHOL FROM COKE-OVEN GAS BY NEW PRACTICAL PROCESS

Commercial production of alcohol from coke-oven gas as a by-product, though long considered a chemical possibility, has been retarded by the lack of an economical process. That such an important development may now be expected, however, is indicated by experiments recently conducted at a large English plant. The coal used yielded coke-oven gas containing about a two-per-cent volume of ethylene, and at 70-per-cent efficiency in absorption and recovery, the 5,800 tons of coal used per week would produce 9,200 gal. of alcohol. As an absorbent, 95-per-

cent sulphuric acid is used, at a temperature between 140 and 176° F. This takes up ethyl-hydrogen sulphate from the gas, from which the alcohol may be recovered by treatment with superheated steam. The sulphur-dioxide by-product may be returned to the coke-oven gas, precipitating sulphur and purifying the gas while providing material for a new supply of sulphuric acid. A contemporary French experimenter reports the discovery of a cheap catalytic agent which greatly hastens the absorptive action of the sulphuric acid.

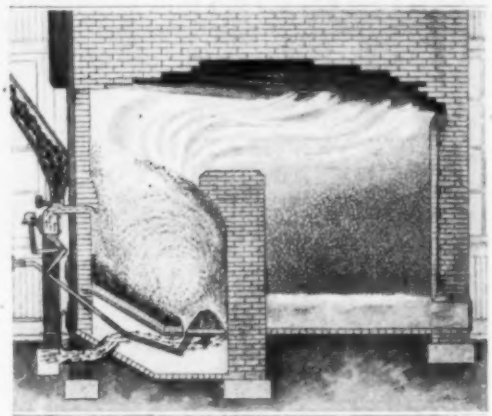
IMPROVE LOOSE-LEAF SYSTEM WITH METAL CARD HOLDERS

Certain faults of the modern loose-leaf system of keeping records are attacked by an Illinois inventor, who provides a metal holder that keeps each card in its place as though it was bound in a book. The thin sheet of steel has a fold at the bottom to receive the edge of the card, and a perforated tab that locks onto the drawer rod. At the top are a small metal tab for numerical marking, and a window for carrying an alphabetical listing. Projections at the sides rest on the drawer edge, and keep the cards upright without using a follower block.



GASEOUS VORTEX IS BASIS OF COMBUSTION PROCESS

A combustion process for heating industrial boilers is noteworthy in that, although it involves the use of very few moving parts, it is self-feeding, and burns completely every particle of combustible fuel. The circulation of air, in short, is made to accomplish the work usually done by mechanical means. Thus, air sweeping in through the front of the furnace carries with it the pulverized coal. The dust and finer particles burn as they fall into the furnace. The larger particles continue downward, and drop upon an inclined bed. Down this bed the coal flows in an incandescent state. Reaching, finally, an oscillating platform, a second rush of air from below carries the disrupted elements upward. Rising, the mass is deflected by a baffle wall toward the front of the furnace again. In this way there is maintained a vortex action



This Cross-Sectional View Shows How, with the Aid of the Inclined Bed and the Baffle Wall, the Air Currents Maintain the Vortex Action

in which is consumed all the coal, and consequently, all the smoke.

AUTOIST'S CAMP TABLE FOLDS AROUND CUPBOARD

For the convenience of the automobile tourist-camper there has recently been devised a combination table and cupboard that can be collapsed to fit snugly into the tonneau. Table and cupboard are distinct. The table top consists of three sections which are so dimensioned and

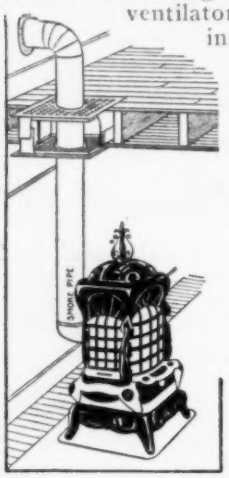
At the Top Is the Cupboard, and Below the Table Which Folds around It to Form a Front, Back, and Second Bottom

hinged that when folded they form a front, back, and second bottom for the cupboard. The table legs are pointed for

pushing into the ground. The cupboard is partitioned off into food, utensil, and ice compartments, and is so constructed that it rests against the back of the front seat, in transit, without undue loss of tonneau leg room. A handle is fixed to the top of the cupboard for convenience in carrying.

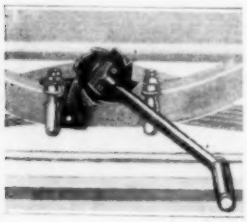
CEILING VENTILATOR INCLUDES ADJUSTABLE AIR DUCT

An adjustable telescopic air duct, which connects the two gratings of a new ceiling ventilator, makes it possible to install the device with only a small amount of labor. Spiral springs, located inside the duct, permit the latter to be extended in length from 7 to 12 in., and serve to hold the appliance in position. The contrivance is made in three styles, one intended to convey warm air directly from lower-floor rooms to those above; another arranged to receive the upper end of a heating-stove hot-air pipe, and a third provided with an opening for an ordinary stovepipe.



RATCHET ON CRANK HANDLE PROTECTS MOTORIST'S ARM

Though the 18th amendment has taken the "kick" out of the nation's beverages, the "kick" still remains, motorists are daily finding to their sorrow, in the cranking handle of the automobile. This action caused by failure to retard the spark, and consequent reversing of the engine, often breaks the motorist's arm. The several million owners of a well-known low-priced car can now protect themselves against this misfortune, however, by fixing to the crank a ratchet apparatus of recent introduction. This can be slipped into place in five minutes, and thereafter will disengage crank and shaft instantly in the event of a back fire.



NEW JAPANNING PROCESS IS NONEXPLOSIVE

Because of the frequency of explosions in japan-baking ovens, manufacturers have been searching in late years for a type of japan which could be used with a noncombustible solvent. And that such a variety has recently been found is the announcement of a great American research laboratory. This water japan, as it is called, is an emulsion of the asphalt-oil base with water; instead of being dissolved in naphtha or kerosene, that is, the base is suspended in water in the form of infinitesimal particles. The solids exhibit no tendency to settle out, remarkably enough, even after months of storage. The methods of applying the water japan are two: the electric dip and the hot dip. The first, used in coating smaller articles, is in principle quite like the electroplating process. The second, applicable to larger pieces, consists in a careful heating, which causes the japan to deposit itself on the metal much as in the first process.

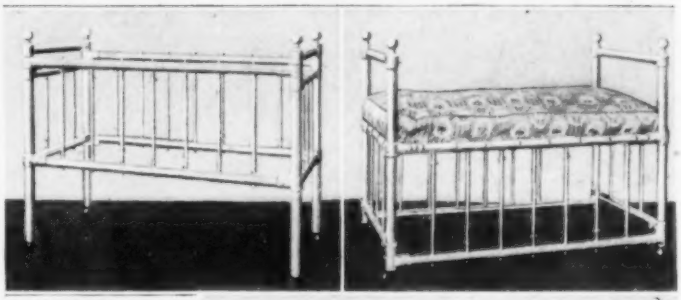
IMPROVISED HARNESS SAVES MAN WITH BROKEN NECK

By means of a rigid harness of steel and leather, preventing movement of the head in any direction, a man with a broken neck is being kept alive in a southern California city, and his ultimate complete recovery is expected. The accident occurred when the victim, a physician, struck his head on the bottom of a shallow diving pool, fracturing the first cervical vertebra and dislocating the next two. The harness used consists of a heavy steel bar, following the contour of the spine and held in place by felt-lined leather straps about hips, chest, and head. Further to insure against any unconscious movement, the patient lies between sandbags so placed as to buttress both body and head. In this position, to effect a cure, he must remain for from three to six months.

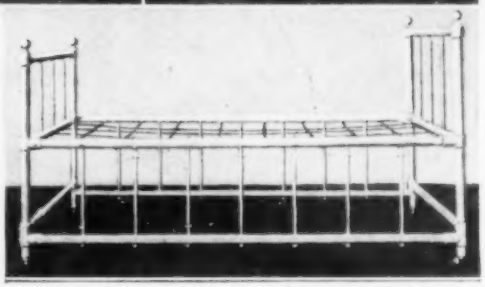
¶A compressed-air cylinder replaces the usual foot lever in the spot-welding machine of a type now being made in Germany. By thus lessening the operator's fatigue, the cylinder increases output.

PROTEAN FURNITURE IS FRENCH INVENTION

A piece of household furniture recently invented by a Frenchman resembles the toy structural sets so popular with the American boy in that it is delivered in a knock-down bundle, and can be put together as the purchaser's fancy or necessity may dictate. Most of the parts are straight tubes of metal; in addition there are supplied joints, casters, and ornamental knobs. The piece most easily assembled, perhaps, is the child's crib. This can be transformed into a settee by interchanging knobs and casters and inverting the whole. By lengthening the various members, again, this settee is made a single or double bed. This furniture is most appreciated on "moving day," though, when half a dozen pieces can be collapsed and packed in a small box or trunk.



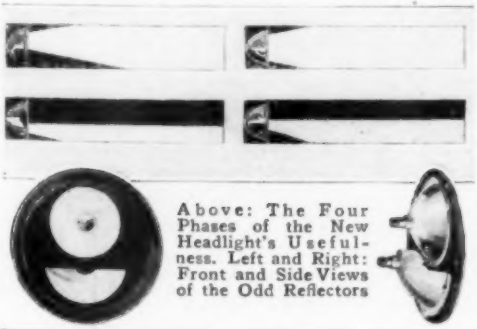
The Crib is Changed to the Settee at the Right by Interchanging Knobs and Casters and Inverting the Whole



By Lengthening and Rearranging the Various Members, Again, the Settee is Transformed into the Single Bed Shown Above

TWO-LAMP AUTO HEADLIGHT USES HALF REFLECTOR

Road-lighting problems of the motorist are attacked in a new way by two Ohio inventors, who have developed a headlight of novel form. Two electric bulbs are used, one above the other. The upper one has a reflector of standard parabolic shape, while the lower has only the bottom half of such a reflector. For road work, the powerful upper lamps are used, and where nonglare lighting is needed, shift is made to the lower lamps, whose bulbs are invisible. Dimming the lower lamps gives a low-consumption parking light, and if exceptional power is needed, both bulbs are used together.



Above: The Four Phases of the New Headlight's Usefulness. Left and Right: Front and Side Views of the Odd Reflectors

LATHE-TOOL HOLDER TAKES ROUND OR SQUARE STOCK

An improved form of tool holder, recently brought out for lathe use, consists of a flat steel bar, plane on one edge and grooved at 45° on the other. A yoke fastened at one end of the bar with a taper pin, and easily removable, carries a $\frac{5}{16}$-in. screw. Square stock up to $\frac{5}{16}$ in. may be clamped to the flat edge of the bar, or round stock from $\frac{1}{8}$ to $\frac{9}{16}$ in. to the grooved edge. A gooseneck spring tool, attached to the holder with a taper screw and nut, adds to the usefulness of the device for cutting threads.

Above: The Tool Holder and Gooseneck Tool Disassembled, Showing Its Construction

The Tool Holder Complete, Grooved Edge Up, with the Gooseneck Tool in Place at the Right End

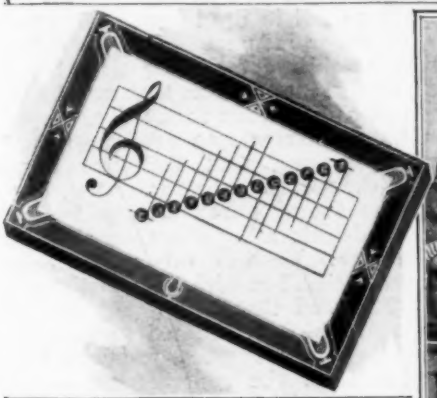
In a District of Southern California Where the Poultry Question Is of Predominant Interest, the High-School Girls Hold Contests in the Streets with a Huge Egg-Shaped Pushball, Watched by Hundreds of Visitors

COPYRIGHT KEYSTONE VIEW CO.

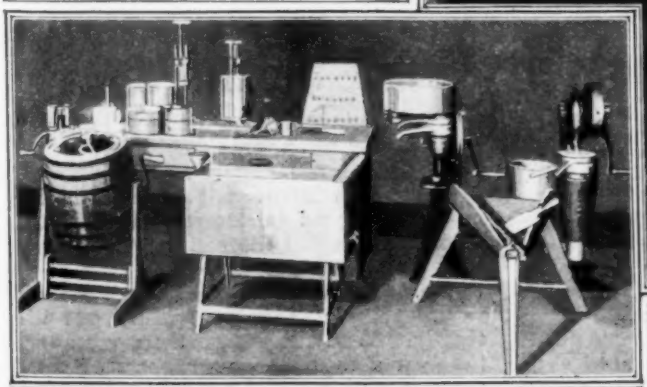
A Doll That Is Popular in Belgium Because It Looks Exactly like the Little Princess Marie-José

Specimens of Coins from Belgium, China, Denmark, Norway, Sweden, Greece, Holland, Italy, Japan, Great Britain, Mexico, Russia, France, Switzerland, Spain, Portugal, Austria, Germany, and Turkey are being Circulated by the Junior Red Cross among the School Children of the Northwest for Their Information

An Hour of Freedom to Do as They Please Is the Boon Conferred upon a Kindergarten Class of 43 in a Southern Ohio City, and Their Use of the Privilege Is Interesting. As may be Seen at the Left, the Girls Generally Choose to Devote the Time to Sewing Dresses for Dolls, While the Boys, Depicted at the Right, Prefer Modeling in Clay and Other Mechanical Pursuits



Even the Youngest Children Soon Learn the Musical Scale When They Press the Notes of This Instrument with Their Fingers and It Plays the Correct Tone



Three Classes in Dairying in a Montana High School Used the Equipment Seen Here Last Season, Making More than 100 Pounds of Butter and Eight Cheeses. All the Apparatus except the Separators Belongs to the School

In the Manual-Training Classes of a Utah School, the Boys Made a Loom, Patterned after a Pioneer Model, and the Girls are Weaving Fabrics with It. The Two in the Foreground are Displaying a Sample of the Product. None of the Class Is Over 14 Years Old

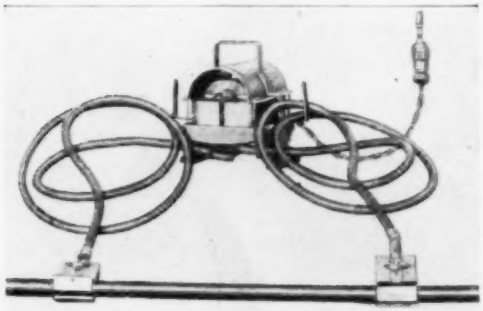
BAG BENEATH DESK TOP IS NEW OFFICE WASTEBASKET

A waste-paper basket now being manufactured for office use cannot be tipped over, is practically invisible, holds two to four times as much as the ordinary container, and furthermore is no basket at all, but a bag. Made of heavy duck over a rectangular wire frame, it is hung beneath a flat or roll-top desk. As the mouth of the bag is wide, and as it extends from one side to the other of the "leg room" beneath the top, it is apparent that any paper tossed toward the rear will be caught by the bag.

The New Waste-Paper "Basket" Is a Bag of Heavy Duck Suspended, by a Rectangular Wire Frame, beneath the Top of the Office Desk

PORTABLE TRANSFORMER THAWS FROZEN WATER PIPES

Thawing frozen water pipes by electric heat is an operation brought within the reach of any plumber by a portable outfit just being put on the market. A step-down transformer, with a carrying handle on its case, is equipped with a 10-ft. cord and plug for connection to a light socket, and two 7½-ft. cables with clamp connectors for the pipe. Lengths of ½ to 1-in. pipe, up to 15 ft., can be treated at one time, wherever alternating current of standard voltage and frequency is available, the consumption being 500 to 650 watts. The outfit weighs but 35 pounds.



The Portable Thawing Transformer Connected, with Its Secondary Cables Clamped to a Water Pipe

NONSMOLDERING GUN WADS REDUCE FOREST FIRES

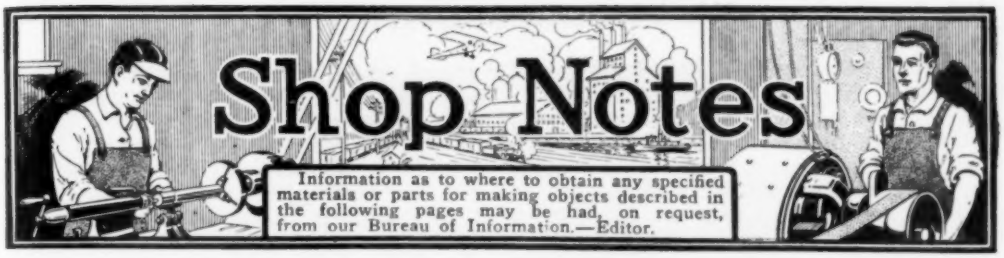
So many forest fires have been traced to smoldering shotgun wads that a western firm has begun the manufacture of a noninflammable and nonsmoldering wad.

The thoughtful sportsman would not, of course, intentionally start a forest fire, but all too often he causes one with his shotgun without knowing it. The ordinary wad is composed of a heavy layer of felt between two layers of cardboard. This type of wad is often ignited by the explosion of the powder charge, and if it happens to fall in dead leaves, pine needles, or other inflammable forest débris, it may smolder for a long time before being fanned into a flame that may be the origin of a disastrous forest fire.

In its experiments to produce a noninflammable gun wad the firm began making them from asbestos. This, however, was found unsatisfactory because it had a deteriorating effect on the bore of the gun. Various other substances were then tried, but with only partial success. The wad that was finally decided upon, and which is claimed to be satisfactory in every respect, presents little deviation from the construction of the ordinary one. The new wad is of cardboard and felt, but is chemically treated to render it noninflammable. The chemicals used, it is claimed, do not damage the bore.

LAWYER'S WILL IS RECORDED ON PHONOGRAPH CYLINDER

By dictating his last will and testament onto a wax phonograph cylinder, instead of writing it on paper, an Iowa lawyer not only has introduced a novel method of recording an instrument, but believes he has eliminated the possibility of fraud. The names of the witnesses, as well as the will itself, were dictated onto the wax, each name being spelled out distinctly. The cylinder then was run through a reproducer, pronounced satisfactory, and sealed into a box for filing. The originator of this odd application of the talking machine points out that changing or tampering with such a record would be a very difficult matter.


Shop Notes
Information as to where to obtain any specified materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

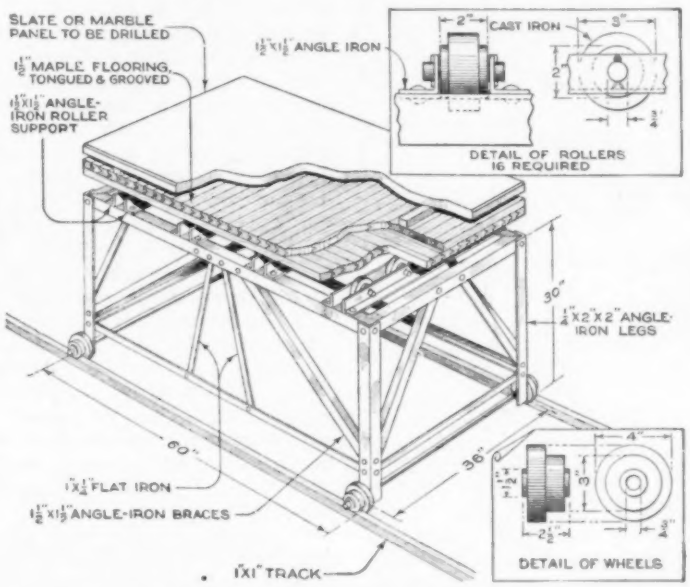
Movable Table for Drill Press

BY ARTHUR F. COX

IN a shop which makes a specialty of drilling and assembling slate and marble switchboard panels, the drilling is done on a radial drill, the panel being supported on the special table shown in the drawing. This table permits one man to handle the largest panel with ease, and adds considerably to the efficiency of the drilling machine.

As shown, the table is built up of angle iron, the four legs being provided with flanged wheels, made to the dimensions shown in the detail drawing, and the whole table moves longitudinally on a track composed of 1-in. square cold-rolled steel, fastened to the floor. These wheels also permit the table to be easily moved to any part of the shop. The table top is made of two layers of tongued-and-grooved hardwood flooring, the upper layer being laid at right angles to the bottom one. The table top runs on four rows of rollers, which are mounted on pins fastened by cotter pins through the angle-iron cross members. This table reduces the cost of the drilling operation considerably, as, by the combination of motions possible, the hole to be drilled is located much more quickly and easily than by using the drill motion alone.

Further, the risk of breaking panels is greatly reduced by the use of the table, and it forms a substantial piece of equipment, in contrast to the usual flimsy wooden support used for this class of work, which generally necessitates two men to handle the panels, and makes drilling a slow and inaccurate job, due to the weight and friction of the panels in moving them over a rough wooden surface. The pins on which the various rollers run should be casehardened, and should be lubricated frequently to insure the utmost freedom in both movements of the table.



A Table That Is of Particular Convenience in Shops Where Large Slate or Marble Panels are Drilled: The Accuracy of the Work is Increased and the Output Augmented

Cutting In Sign Letters

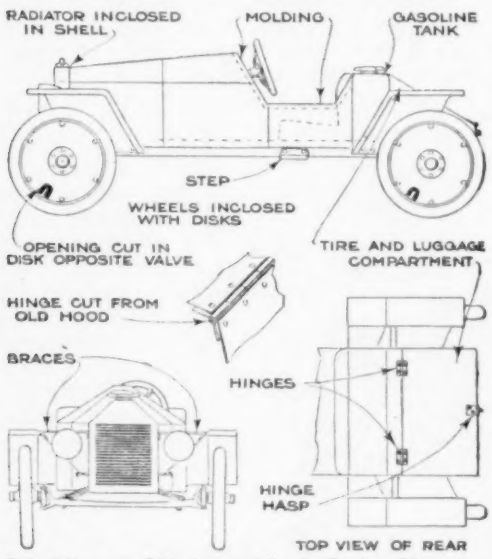
The sign painter often experiences considerable difficulty, when painting on soft woods, on account of the paint's tendency to spread and follow the grain of the wood and so spoiling the clean-cut lines of his letters. Some attempt to overcome this by painting the board with a solid background and then painting the letters over this, but this method is not advised

as with but little exposure the background will show through the painted letters.

It will be found much easier and more effective to lay out the lettering on the bare board and then, with a sharp knife, cut deeply along the lines of the letters before painting. In this way the letters and background may be painted at the same time and in different colors without difficulty, and the job will stand exposure.

Designing and Making a Speedster Body for the Old Automobile

The desire of most owners of old cars is to "cut it down" and make a "racer"



Rebuilding an Old Automobile Is Rather More Intricate than is Usually Considered, but by Using Care the Results will Amply Repay the Effort

out of it, or at any rate provide the old chassis with a body that will create the impression of power and speed. Many such attempts are foredoomed to failure, because the body is designed with no reference to drawings, patterns, or the tool equipment involved.

Preliminary to anything else, a scale drawing of the chassis and the new body should be made, and after the builder has established, to his own satisfaction, that the new body will fit the chassis, then only should the actual work be undertaken. However, a complete set of full-sized paper patterns should be made; with these the builder can determine whether the parts will fit together correctly, and at the same time rectify any errors of calculation, or judgment, that may have been made in the preliminary scale drawing.

The illustration shows a body that possesses straight lines throughout, as it is easier to work the sheet metal with sharp, angular lines than any other way, but the variety of design is infinite, and is only limited by the skill, cash, and facilities at the command of the builder.

The material most commonly used is No. 18 or 20 gauge sheet iron, although the lighter and more expensive aluminum can be used as well as a lighter-gauge iron, but the latter is inadvisable. For work of the kind shown in the drawing, the most essential tools will consist of a wooden mallet, tin shears, and riveting and soldering equipment. Most amateur builders fall into the error of trying to apply the component parts of the body to a wooden frame with nails, which invariably results in a botched and unsatisfactory job. The seams should at least be soldered or, preferably, brazed, and later these joints are finished off flush; thus a practically one-piece body is obtained.

Most speedster designs involve the necessity of more or less new framing under the cowl, and a new instrument board, the omission of which is another common blunder. Also, it is usually desirable to lower the steering post, and suitable means must be provided for supporting it; this is generally done by inserting wooden wedges between the dash and steering-post bracket, unless it is desired to make a special metal bracket.

Disk wheels are merely sheet-metal disks bolted to both sides of the wheels, with an opening for access to the tire valve. Such wheels, on the average light car, are not to be particularly commended, however, as they are not entirely satisfactory, and at the same time detract from that "low, rakish" appearance usually sought.

It should be remembered that the aim is to build a neat, individual automobile body and not a boiler, and that, therefore, the use of rivets and nails for closing seams should be shunned, since both give positive evidence of an amateur's handiwork.

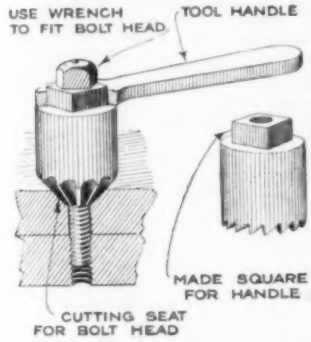
Etching Glass with Acid Fumes

To etch glass with various designs it is thoroughly cleaned, the parts that are not to be etched are covered with wax or Brunswick black, and the glass is exposed to the fumes arising from hydrofluoric acid (poison). If hydrofluoric acid cannot be had, the same effect is obtained by scattering an even layer of powdered fluorspar in a hard-rubber or earthenware tray, and pouring sulphuric acid into the

dish; then placing the glass, face down, over the tray and allowing it to remain until the etching has been carried to the proper depth.—Hugo J. Engel, New Braunfels, Tex.

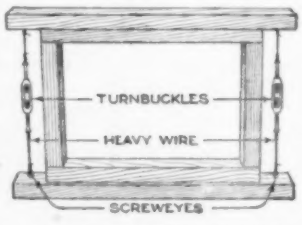
Hand-Operated Counterboring and Countersinking Tool

A hand-operated counterboring and countersinking tool, such as the one shown in the drawing, will find many uses around the shop. The countersinking tool is serviceable for obtaining accurate alinement of countersunk bolt heads in boiler and plate work. After drilling and tapping, an ordinary bolt is inserted through the tool and the desired amount of metal is removed by rotating the handle, the proper cutting pressure being obtained by screwing down the bolt with a wrench, or a wing-headed bolt, for tightening with the fingers, can be used. Use of this countersinking tool causes the bolt to seat evenly, as the seat is cut concentric with the threaded hole. The counterboring tool is nearly the same as the countersink, but is used for spot facing the rough surface of a casting to provide a seat for cap screws or nuts.—G. A. Luers, Washington, D. C.



An Emergency Gluing Clamp

A woodworker, having occasion to make a mortised frame, but having no clamps for holding the work together while the glue dried, devised the arrangement shown in the drawing, from two pieces of stout timber. A screweye was screwed into each end, and both pieces were connected together by wires and turnbuckles which were screwed up to give the desired compression against the glued joints.—Harry H. Houck, Rochester, N. Y.



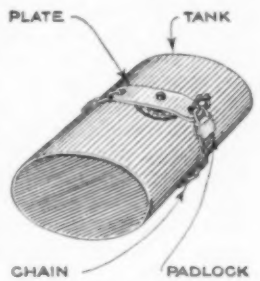
House Moving by Steam Roller

A small house was moved nearly a quarter of a mile through the streets of a populous town by a steam road roller. As the roller was not powerful enough to haul the building when connected directly to it, a block and tackle was used, one block being attached to the load and the other to trees and poles along the route; the free end of the rope was attached to the steam roller. The house rested on wooden rollers and the machine was able to haul it along about as fast as the men could take the rollers from the rear and replace them under the skids in front.—W. H. Sargent, Rutland, Vt.

A Small House being Dragged a Quarter of a Mile through the Streets of a Populous Town by a Steam Roller

Lock for Fuel Tank on Truck

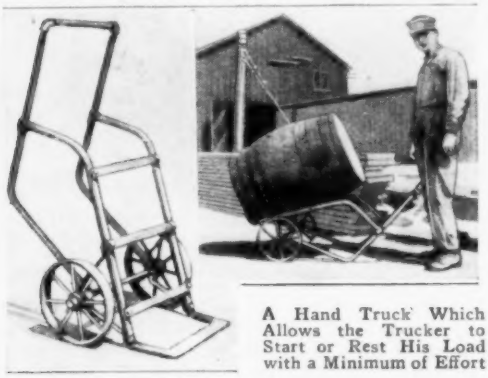
The owner of a truck that was stored in a public garage missed his gasoline, and to prevent further unauthorized removals attached the lock shown in the drawing to the tank. The lock consists of a piece of stiff sheet iron, formed as shown and drilled with three holes, one for fitting over a projection in the top of the filler cap; a suitable length of chain is attached to one of the other holes. The chain is passed around the tank and through the hole in the opposite edge of the plate; this chain is drawn up tight and locked in place by passing the bolt of a padlock through one of the links, as shown. The chain can be wrapped with canvas, or inserted into a piece of rubber tubing, to protect the finish, if desired.—D. B. Templeton, Bayonne, N. J.



¶Old plane bits can be made into excellent scrapers for wood-finishing work.

Truck Made of Pipe

The hand truck shown in the drawing allows the trucker to start or rest the load with a minimum of effort, the bent pipe



A Hand Truck Which Allows the Trucker to Start or Rest His Load with a Minimum of Effort

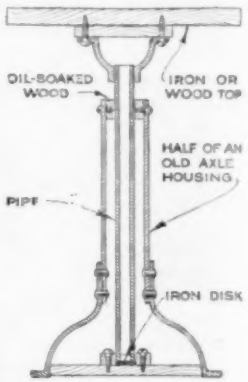
underneath keeping the truck in perfect balance while the load is at rest. By raising it a few inches from the ground, the load is ready for transportation. The bottom part is made of ½-in. pipe, extending 2 ft. to the bend, which is about 85°; then extending 1 ft. to the tee, and then 2 ft. to an ell at the extreme end, which serves to connect a duplicate piece, on the opposite side, with a 2-ft. handhold. The lower end of each piece is connected to a cross through one side of which the axle rod passes; two nipples continue from these crosses; these are flattened and bolted to another set of two pipes, the upper ones, which extend about 3 ft. to the bend, about 45°, and the ends are connected to the tees of the lower support. Three horizontal braces of flat iron are provided and riveted to the pipe frame, as indicated. If barrels are to be handled, these pieces should have a slight curve to conform to the shape of the barrel. The "bill," which is also made from flat stock, is formed as shown, with rounded ends which are inserted into the pipes and secured with bolts.—Claude Wagner, Redondo Beach, California.

Waterproofing Drawings and Tracings

Shellacking drawings and tracings, to prevent soiling, is a well-known process, but if the drawings are to be kept, or used, in places where there is more or less moisture, a better coating is formed by a solution of rubber and benzol. Such a solution is made by dissolving about ½ oz. of "uncured" rubber in ½ pt. of benzol, in a quart jar. The solution will be ready for use after it has stood about 24 hours. When a drawing is to be coated, the solution is thinned with benzol until it will flow easily under the brush; the drawing should be coated on both sides. Ordinary rubber cement can be similarly used by diluting it with gasoline, or benzol, to approximate the proportions mentioned.—Samuel Guy, Chicago; Ill.

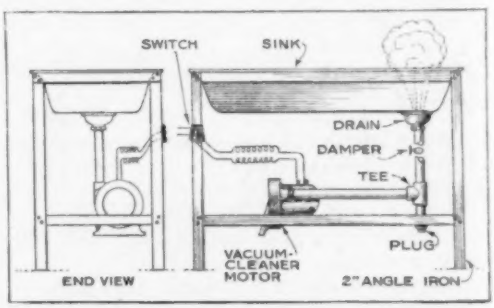
Revolving Table from Scrap Auto Parts

In almost every shop there is much work that could be done more conveniently if a revolving table was used, but only a few shops are equipped with such tables. The table shown in the drawing is designed to be made from junked automobile parts that can usually be found around an auto-repair shop. Half of an old rear-axle housing serves as the main support, which is provided at its upper end with a disk of oil-soaked wood held in place with screws; the lower bearing consists of an iron plug which is fastened into the end of the pipe and rests upon a well-oiled board. The board at the bottom should be carefully fitted so that no play will be possible. The top, which should not be more than 2 ft. in diameter, may be made of either wood or iron.—S. E. Gibbs, Ames, Ia.



Forge Made from Old Sink

A convenient forge, for the home workshop, that has its air furnished by the family vacuum cleaner, is made from an old kitchen sink. The sink is lined with



A Convenient Forge, for the Home Workshop, is Made from an Old Kitchen Sink, the Family Vacuum Cleaner being Commandeered to Furnish the Air Blast

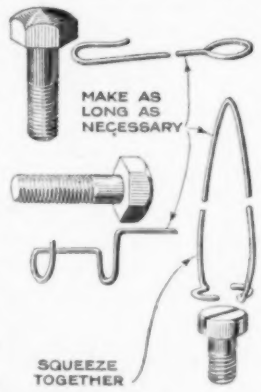
fire clay, or other plastic refractory material, and a stand of angle iron is provided to support it at the proper height. The vacuum-cleaner motor and blower is mounted on crosspieces underneath in such a manner that it can be readily removed when its services are required for cleaning. The bowl-shaped sink drain makes an acceptable tuyère, and is connected to the dust-bag connection of the vacuum cleaner, as shown. A damper is provided in the air pipe for regulating the air blast. The short length of pipe connected to the bottom of the tee, and closed with a plug, receives such ashes as fall down, and should be periodically cleaned out.—Chas. Worcester, Webster Grove, Mo.

Economy in Using Comb Foundation

The common method of creasing a half inch or so of comb foundation and melting it, to cement it to the frame, is anything but economical. By holding the strip of foundation in place, without creasing, and running a hot knife along the edge to cement it to the frame, considerable foundation is saved. — John Pichotta, Stewart, Minn.

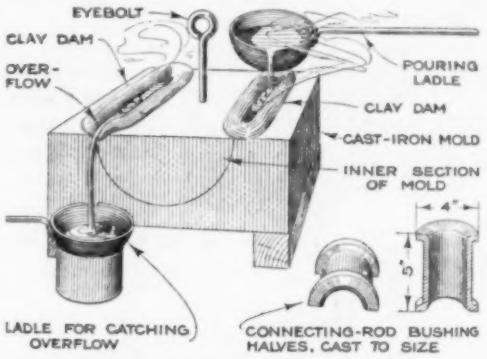
Entering Small Screws in Awkward Places

In overhauling or assembling small machines, the mechanic, sooner or later, encounters one or more screw holes that appear to be inaccessible. The insertion in such holes of small bolts and nuts without proper tools is most exasperating, and the simple tools shown in the drawing are intended to overcome the difficulties. One of them is merely a hook at the end of a piece of light, stiff wire, for placing bolts and screws into a hole when they can be dropped vertically. The second tool is for placing the parts into horizontally drilled holes, and the third is for holding the bolt or screw vertically, while it is being lowered into an inaccessible hole at the bottom of a well or pipe. All three tools can be made in a few minutes with a pair of pliers.



How to Pour Good Babbitt Bearings

Babbitt bearings which are full and up to size, and with a finish as good as die



Babbitt Bearings, Full and Up to Size, and with a Finish Equal to Die Castings, can be Poured in Metal Molds by Taking a Few Simple Precautions

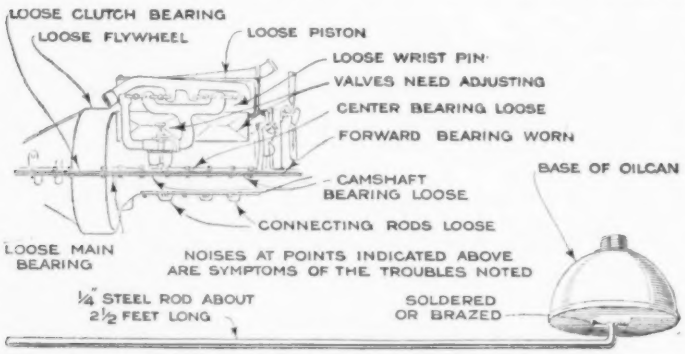
castings, can be poured by anyone in a metal mold, if certain precautions are taken. Have two openings to the mold, as far away from each other as possible; one opening is the pouring gate and should be surrounded with a clay dam, about ½ in. deep. The other opening is the overflow, around which a similar dam is built, but a small groove is pressed into the clay, on one side, to allow the overflowing metal to run off into a ladle underneath, as shown in the drawing. The idea back of this is, that as the metal, which should be just hot enough to char a white-pine stick, heats up the mold to almost the temperature of the metal itself, all grease and dirt, which would cause trouble and produce gas bubbles, are washed away. Only one precaution must be taken, and that is to have the bottom of the groove in the dam around the overflow opening about ⅛ in. higher than the top of the mold; this is to allow for the contraction of the metal as it cools. When the mold is full, stop pouring, but do not remove the ladle until it is seen that the metal does not shrink below the top of the mold; if this happens, pour in a little more metal. — Joe V. Romig, Allentown, Pa.

Truing a Celluloid Straightedge

When an ivory or celluloid straightedge becomes too badly nicked and worn, a good way to true it up is to grind it on a perfectly plane surface which has been covered evenly with a thin coating of paste, made from very fine emery flour and oil.—J. Alexander, Lincoln, Neb.

Homemade Knock Detector or Stethoscope

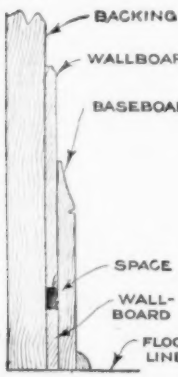
An improved and effective knock stethoscope, for detecting the location of knocks due to wear and looseness of bearings and moving parts of machinery, particularly of automobile engines, is made from an ordinary oilcan and a length of steel rod. As shown in the drawing, the steel rod is bent at one end and soldered, or brazed, to the bottom of the oilcan, and the spout of the can is removed. In use, the threaded collar of the oilcan is applied to the ear and the end of the rod is placed against the engine at the points indicated, to detect any of the various irregularities common to internal-combustion automobile engines.



The Stethoscopic Principle of Magnifying Sound is Used for Detecting Knocks, and Other Irregularities, Common to Internal-Combustion Engines

Preventing Water Stains on Wallboard

When applying wallboard panels, never allow them to reach completely to the floor, for they will be almost certain to absorb scrub water—sometimes to the height of 18 in. A better procedure in the application of such panels is to lay a narrow strip, about 2 in. wide, next to the floor, allowing an open space of about 1 in. between this and the panel proper, as shown in the drawing. The narrow strip will provide an even backing for the baseboard, the whole construction will be concealed, and the panels will be prevented from unsightly moisture stains.—Doncaster G. Humm, Phoenix, Ariz.

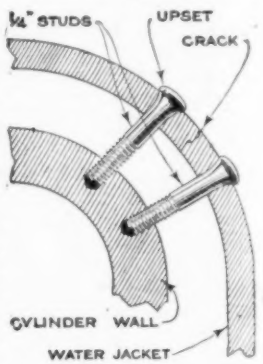


An Auxiliary Draft for Slow-Steaming Boilers

When a steam boiler, such as used in factories, apartments, and other large installations, gets too old to steam rapidly, and when impaired draft and extreme weather cause trouble, a sure method of obtaining satisfactory results is to run an air line into the stack, above the smokepipe inlet; the pipe should point upward, inside the stack, this being accomplished by the use of an elbow and nipple. When the air pressure is turned on a forced draft is created which brings the steaming up to normal. Exhaust steam may also be used.—P. P. Avery, Garfield, N. J.

Repairing Cracked Water Jacket

Hundreds of engine cylinders have been scrapped because of cracked water jackets, but the last journey of a casting for a 10-hp. stationary engine was indefinitely postponed by a simple method. Small holes were drilled at each end of the crack, to prevent it from extending farther. Three-quarters of an inch on each side of the crack, and 1 in. apart, 17/64-in. holes were drilled through the jacket and countersunk; through these holes, a 3/16-in. drill was inserted, and holes were drilled directly beneath them into the cylinder wall. Great care must be taken in drilling these holes, to avoid drilling through the cylinder wall. The smaller holes were tapped with a ¼-in. bottom tap. Iron studs, ¼ in. in diameter, were threaded at one end and screwed in tightly. The studs were then sawed off on the outside, to within ¼ in. of the casting; the projecting ends were upset, or riveted, and the crack was drawn together, making a water-tight joint which is unaffected by temperature changes.

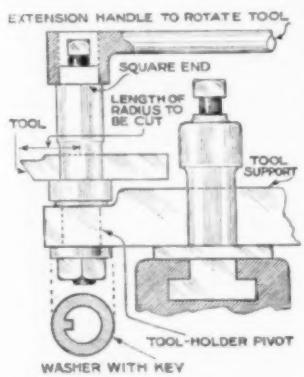


Railroad-Car Repair Signal

Most persons are familiar with the blue flags which repairmen place on the ends of cars undergoing repairs, in order to prevent other cars from being pushed against those on which men are working. It is sometimes difficult for brakemen riding on car steps to see these flags, as they are often placed in the coupler and thus are in the center of the track. This is an unsafe practice, and to obviate danger, one railroad uses a square metal marker on the end of a metal rod. The rod is provided at the lower end with a clamp that fits over the rail, and is bent at an angle so that the marker, which is painted blue with "safety" printed in large white letters, is held to one side of the track. When two such signals are used, one on each side of the track, they are plainly visible to switching crews at all times, no matter where they may be riding.

Lathe Tool for Radius Cutting

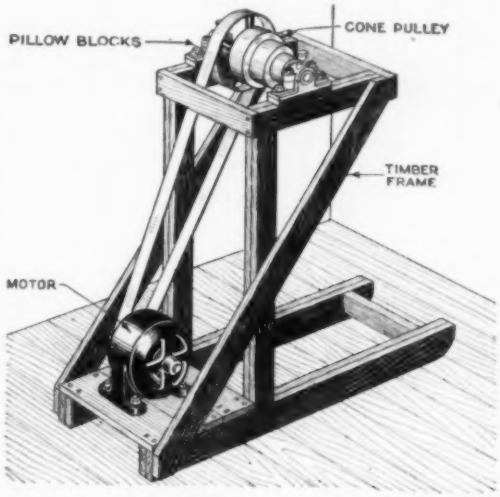
The tool shown in the drawing is intended for radius cutting in the lathe. Such a tool permits cutting a radius of practically any size, and on account of the light cut that it will take, chattering is overcome. The device consists of a support which is clamped in the toolpost; the end of this support is drilled to take the pivot pin of the tool holder, as indicated, the holder having a circular end which is a snug rotating fit in the hole. A setscrew is used to hold the cutting tool in the holder, and an extension handle is provided for moving the cutter through the arc of the circular face to be cut. To cut a curve of any desired radius, the diameter of the holder being known, subtract half this diameter from the length of the radius to be cut; the remainder is the distance that the tool should project from the holder, the tool being easily set with a scale.



Ordinary tarred roofing paper makes a good emergency substitute for a blackboard.

A Portable Countershaft

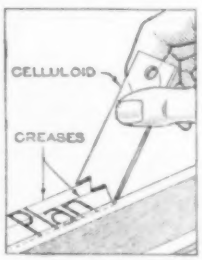
The drawing shows a portable countershaft that can be used to advantage under many conditions. A heavy timber frame was made, and an electric motor was attached to the bottom platform; at the top of the frame, two pillow blocks were placed, to support a shaft and cone pulley, from which a belt ran to the motor. With such an arrangement, it is a comparatively simple matter to transport it to any part of the factory, to take the place of the regular motor that is out of commission, or for temporarily driving a single machine.—J. H. Moore, Toronto, Ontario.



A Portable Countershaft for Emergency Purposes, That can be Transported to Various Parts of a Factory with Comparative Ease, Is a Time and Money Saver

Tool for Marking Lettering Lines

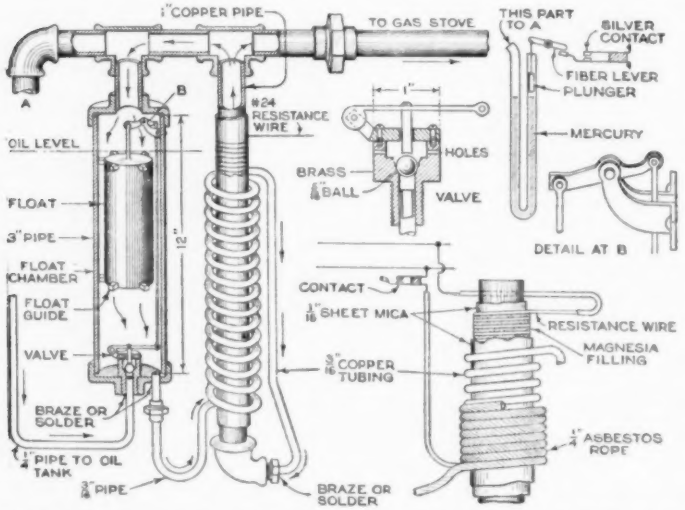
In drafting rooms where there is a large amount of lettering to be done, the guideline marker shown in the drawing will save considerable time in ruling, and later, in erasing lines. These markers are made in any desired size from pieces of old celluloid triangles. The notches are made the proper distance apart, and the tool is drawn along the edge of a square or angle with sufficient pressure to make a light crease on the paper.—B. F. Dashiell, Dunkirk, Maryland.



An Oil-Gas Generator

By A. N. CAPRON

WITH the coming of cold weather and its usual concomitant of low gas pressure, every user of gas will be interested in the simple attachment shown in the drawing, by means of which the shop stove can be converted into an oil stove when the gaspipes freeze—or when there is insufficient gas to go around.



An Easily Constructed Generator of This Type will Be a Boon to Users of Gas Who are Confronted with Frozen Gas Pipes or Reduced Pressure. It is Adapted to Generating Kerosene Gas and Is Self-Regulating

It is well known that the vapor of kerosene oil, commonly known as coal oil, flashes, or can be ignited, when the oil is heated to from 120° to 140° F., but the oil will not produce gas in abundance until a temperature of 250° is reached. This can be demonstrated by filling a metal tube, 1 in. in diameter by 16 in. long, half full of kerosene and attaching a gas jet over the open end. By heating the kerosene in the tube the jet can be lighted, and it is upon this principle that the generator described herein operates—the cold oil enters one end of the pipe and comes from the burner as a gas or vapor.

The first item that will be required is a piece of brass or copper pipe, threaded at both ends. One end of the pipe is fitted with a reducing elbow and plug, as indicated. For a distance of 12 in. from the elbow the pipe is wrapped with a 1/16-in. layer of sheet mica, and over this is wound sufficient No. 24 resistance wire, or ribbon, to produce a temperature of approximately 300° F. inside the pipe when connected across the supply main. The separate turns of resistance wire should be from 1/32 to 1/16 in. apart. The ends of the heating element are solidly fastened and brazed with silver solder to 12 in. of size 10 asbestos-covered lead. Rub some magnesia paste, made by mixing equal parts of powdered magnesia and plaster of Paris with water, or better still, the investment compound which can be obtained from dentists, between the turns to hold them in place. The whole coil is covered with a 1/16-in. layer of mica. Twelve feet of 3/16-in. annealed copper tubing will now be required. Keep 6 or 8 in. of one end free, and beginning 1 1/2 in. above the reducing elbow, wind the tubing around the insulated heating element, as shown in the drawing. Clamp the last turn to hold it firmly, and bring the loose end down to the plug in the reducing elbow. The brass plug is removed from the elbow and drilled through with a 3/16-in. hole, counterboring, 1/8 in. deep, with a 1/4-in. drill. Screw in the plug with powdered graphite, measure the tubing to fit the hole in the plug, cut to size, remove the burr, and braze the end in the plug, this being facilitated by the counterbore. This joint must be oil and gas-tight. The entire assembly is now tightly wrapped with 1/4-in. asbestos rope to within 2 in. of the upper end.

A piece of 3-in. brass or iron pipe with 1/16 or 1/8-in. walls, and caps to screw over the ends, are also needed for making the float chamber. The upper cap, as shown in the drawing, is drilled and tapped to take a 1-in. pipe, the lower cap being drilled and tapped with 1/2 and 3/16-in. openings. A cylindrical float, 2 1/4 in. in diameter by 6 in. long, is provided with 10 lugs or guides as shown in the drawing, to keep it centered in the float chamber without friction.

A valve is made, according to the detail drawing, from 1-in. round brass. The valve consists of two parts which are held together with screws, as indicated. The lower end of the valve is turned down to 1/2 in. and threaded to fit the

hole in the bottom cap of the float chamber. The valve is countersunk with a countersinking drill, or rose countersink, to provide a seat for a 5/16-in. steel ball, which acts as a check valve in preventing hot oil from backing up into the supply tank. The upper half of the valve is drilled as in the drawing, and the lever is attached; the metal rod which presses against the ball being fastened somewhat loosely in the lever, to permit sideplay. Quarter-inch pipe is used to connect the oil tank with the valve, and the pipe should be sweated to the former after assembly. The oil supply should be placed from 5 to 8 ft. above the valve. A short piece of 3/16-in. tubing is soldered into the remaining hole in the bottom cap of the valve chamber, and a union is attached for connecting the remaining loose end of the copper coil, in the manner shown. The heating coil and the float chamber are connected together by the simple piping arrangement shown, and if the automatic cut-out, to be described, is not used, the end at A is plugged.

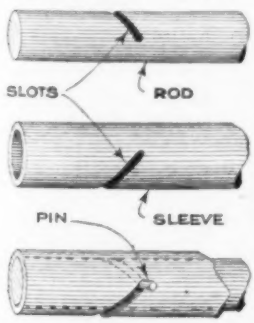
The automatic cut-out, which is connected to the end of the pipe at A, consists of a U-shaped metal or glass tube, half-filled with mercury, which acts on a fiber plunger inserted into the free end of the tube so that, when the pressure causes the mercury to rise, it will actuate the lever and open the heating circuit, automatically relieving the pressure, and as the pressure falls, the electrical contact is again established, the operation being automatic. The oil flows into the float chamber through the valve from the gravity tank. As the float chamber becomes filled, the float rises, which forces down the plunger and cuts off the supply. After sufficient pressure has been generated, the pressure forces the mercury in the U-tube up, and the current is cut off from the heating coil. At the very worst, if anything should fail, the mercury will be forced out of the tube which performs the function of a safety valve.

Garter Studs Make Instrument Feet

In assembling a small model, some small rubber feet were needed to insulate the machine. For the purpose some old hose supporters were used. The metal parts, with the rubber studs, were removed and attached to the underside of the model.—Frank W. Bentley, Missouri Valley, Ia.

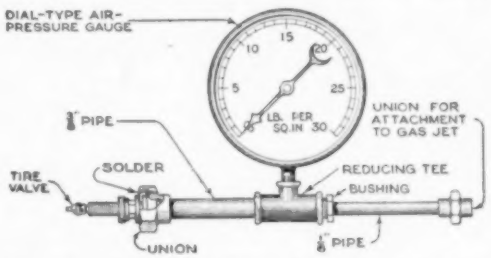
Pinning Sleeve to Shaft without Drilling

Being confronted with the task of pinning a small sleeve to a rod without having a drill at hand, one man did the job in the manner shown, with a hacksaw. Slots were cut in both shaft and sleeve, as indicated. When the two parts were slipped together, the slots lined up to form a hole where they joined. A pin, made from a finishing nail, was driven through and the ends hammered down flush with the top of the sleeve. Since there was little strain on the parts, this pin held perfectly.—Thos. W. Benson, Philadelphia, Pennsylvania.



To Find Leaks in Gas Pipe

Leaks in gas pipes can be detected with an ordinary dial-type air-pressure gauge.

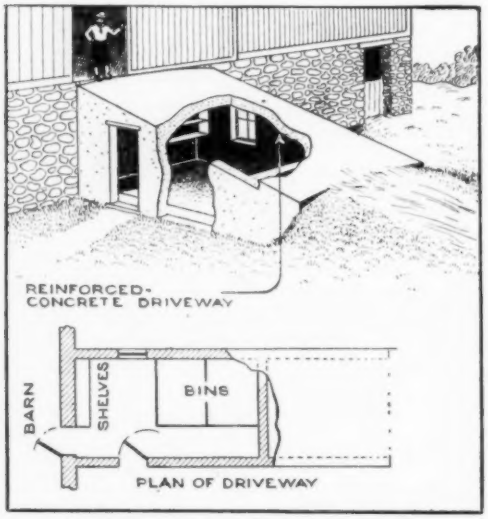


Dial-Type Air-Pressure Gauge, Equipped for Finding Leaks in Gas Pipes: A Tire Pump is Required to Operate the Device

The device is connected with two short pipes of different diameters by means of a reducing tee. A tire valve is installed in the end of the larger pipe, while the smaller is fitted with a union which can be screwed on a gas jet. When a test is to be made, the flow of gas is stopped by turning the meter valve, and the gauge is attached to a jet. A tire pump is connected with the tire valve, and pumped until the gauge shows a certain pressure. If this pressure falls after the pump has been removed, it indicates leaks in the gas pipes. In case a certain section of the latter is believed to be leaking, it should be disconnected from the other pipes and plugged before it is tested.—Ed. Borchik, Cleveland, Ohio.

Root Cellar under Driveway

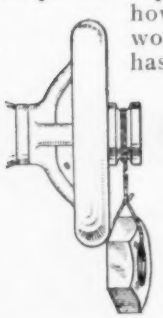
Farmers are more and more learning to utilize waste places. One farmer made a very satisfactory root cellar under the driveway to the second floor of his barn. Since the top must be reasonably thick, and the sides or walls were required for the drive, the only extra cost was that incurred by putting in a window and doorway, and making the roof slightly thicker, to stand up under the strain of the loaded wagons to be driven over it.—Dale R. Van Horn, Lincoln, Neb.



Instead of Filling Up the Space under the Driveway, This Farmer Uses It for Storing Roots

Tapping in a Lathe

When tapping a job in the lathe, running the center against the end of the tap keeps the tap straight. In doing this, however, the mechanic cannot work very rapidly because he has three things to attend to—power, tap wrench, and tailstock wheel—and but two hands to do it with. This disadvantage may be overcome; if a small pulley is made and tapped out to fit in place of the tailstock nut, the center can be fed against the tap as fast as it advances into the work, leaving both hands free for the power and tap wrench; this is accomplished by attaching one end of a piece of stout twine to the pulley and wrapping it around several times, and then fastening the end of the twine to the pulley arm. A weight is attached to the free end, and as the tap advances in the work the tension on the string turns the tailstock wheel and keeps the center against the tap.

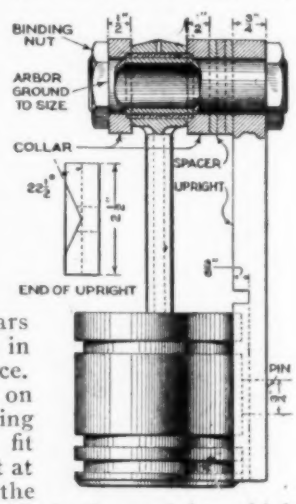


Tracing Wheel Rules Dotted Lines

Dotted lines may be made very rapidly with a tracing wheel, such as used by dressmakers and seamstresses, and a piece of carbon paper or typewriter ribbon. To make the dotted lines, place the ruler in position and slip a strip of carbon paper, or typewriter ribbon, under the edge. The dotted line is made by passing the toothed wheel over the paper or ribbon. If a whole sheet of paper is to be ruled with dotted lines, a sheet of carbon paper is placed, face up, under the page and the lines are ruled. The closeness of the dots may be varied by using wheels with different numbers of teeth. To prevent cutting holes in the paper, the points of the teeth are dulled with a file.

Connecting-Rod Babbitting Fixture

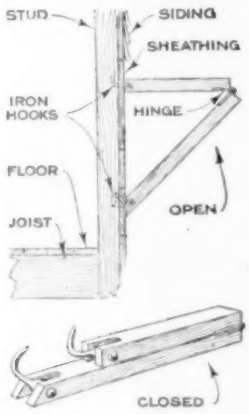
The most difficult part of the job, in rebabbitting the crank bearing of a connecting rod, is to make sure that the bearing is exactly at right angles to the center line of the piston. A very simple fixture has been found to insure this. A piece of 1-in. iron pipe, ground to size, is used as the arbor, and collars are mounted as in the usual practice. These are held on by the binding nuts, which fit onto threads cut at the ends of the arbor. At one side is the upright, which is merely a stiff bar of cast iron, with a V-groove cut in its lower end, in which the piston may fit. In this grooved part is cut a hole the same size as the wrist pin, and spaced the same distance from the center of the arbor and crank bearing. A short pin is inserted in this hole, and the piston is clamped against the groove, with the pin just entering the wrist-pin



bearing. The larger bearing is then centered over the arbor, and a spacer, or collar, inserted, of proper thickness to bring the piston rod just perpendicular to the pipe arbor. This thickness will of course vary with the diameter of the piston; it can be found either by calculation from the piston size, or by measurement. The metal is poured through the hole provided in the rough bearing, and should be fitted afterward by scraping.

A Folding Scaffolding Support

A folding scaffolding support, for the use of carpenters when applying siding to a building, is shown in the drawing. These supports, or jacks, are made from two 2 by 4-in. pieces connected together at one end with a hinge, the free ends being provided with pivoted hooks in the manner shown. In use, the mechanic bores holes through the sheathing on the side of the building and inserts the hooks, as indicated, lays his boards and proceeds with the application of the siding, working from the top to the bottom of the house. The location of the scaffold is changed from time to time to accomodate the work as it progresses. —Jesse L. Blickenstaff, N. Manchester, Indiana.

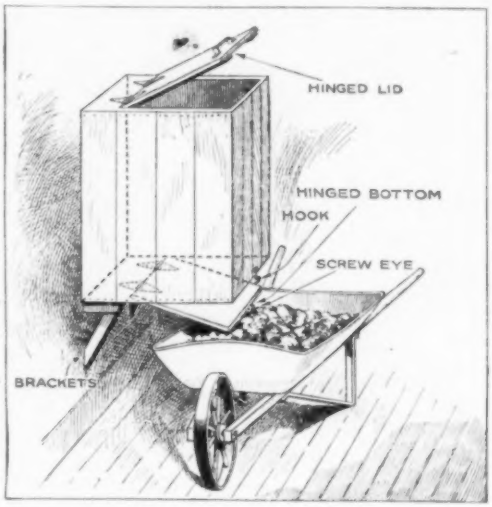


Guide for Sawing Bottom of Door

When the amount to be trimmed from the bottom of a door is so small that difficulty is experienced in guiding the saw, the work will be facilitated by a simple guide. If, for instance, a cut just the thickness of the saw is to be removed, the line is marked and a narrow strip of wood is nailed to the bottom. Only two nails are required, one at each end of the strip, and these are placed several inches back from the end. The cut is then started, holding the saw against the strip, and continued until the first nail is reached; this is withdrawn and driven in back of the saw, the operation being repeated when the second nail is reached. The guiding strip will be found more effective if made of hard wood.

Trash Box for Garage or Shop

A trash box should form part of the equipment of every well-kept shop, as it provides against the accumulation of dirt

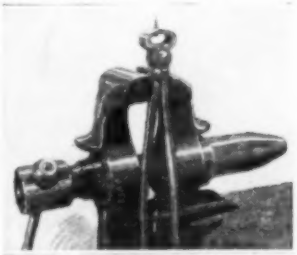


A Trash Box, for the Shop or Garage, That Discharges Its Contents into a Wheelbarrow Underneath

on the floors and in corners. The drawing shows an improved box for this purpose, which is readily made and easily emptied; it is mounted high enough to permit a wheelbarrow to be run under the box when it is to be emptied. A hinged bottom permits removal of the contents without the necessity of overturning the box. The box may be built of wood, but if it is to receive oily waste and rags, sheet metal would be preferable.

Filing Small Screws

Filing the ends of small screws is usually rather awkward, on account of the difficulty of holding them firmly. This difficulty can be overcome by placing the screw in a pair of pliers, or nippers, and screwing the latter up tightly in a vise, as shown in the photograph. Care should be taken to place the pliers, or nippers, in the vise as close to the fulcrum as possible to prevent possibility of cutting the screw.—F. R. M. Dunseith, Scranton, Pa.



Ice-Cutting Machine Made from Automobile Parts

With very few exceptions, standard parts from an automobile were used in the construction of the ingenious ice-cutting machine shown in the drawing. The 40-in. circular saw is driven directly from the engine by means of the differential bevel gears. A substantial angle-iron frame, 13 ft. long, supports the engine, radiator, and other parts, and the whole is mounted on a set of runners, as shown, in such a manner that the saw can be lowered or raised as desired. Handles are attached to the rear of the frame for guiding the machine, and throttle and spark-control rods, as well as the clutch-control lever, are within easy reach of the operator's hands. There is a gauge at either end of the machine by which the depth of cut is regulated, while adjustable gauges at each side engage in the previous cut and thus the cuts are uniformly spaced.

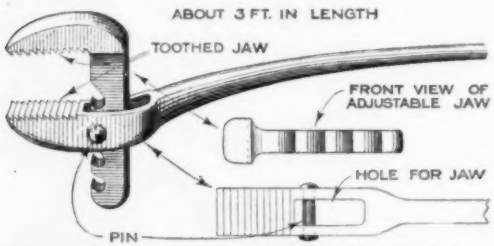
Automobile Parts are Used to Make a Self-Propelled Ice-Cutting Machine. At the End of the Season the Machine is Dismantled and the Car is Reassembled

In operation, the engine is cranked in the ordinary way and the clutch thrown into engagement. For use with a saw of the diameter mentioned, about 500 r.p.m. will be found sufficient. As soon as the saw touches the ice it drops right into it, and the machine immediately begins to advance under its own power and must be held back by the operator, who otherwise would be forced to run to keep up with it. The top of the saw is covered with a sheet-metal guard.

In designing this machine, the object in view was to use the parts from the automobile without alteration, so that, at the end of the ice-cutting season, the machine could be disassembled and the parts again installed in the automobile.—Bayard D. Evans, Scranton, Pa.

Adjustable Pipe Wrench

The pipe wrench shown in the drawing, which has a wide range of adjustment, is the product of a plumber's ingenuity. The main feature of this tool is the adjustable jaw, which permits it to be adjusted rapidly to handle any size of pipe within the wrench's capacity; the jaw may be removed entirely, and the handle used as a small pinch bar. All parts are hand-forged from a good grade of steel, and the jaws are hardened after the teeth have been cut.



A Pipe Wrench with a Wide Range of Adjustability That Also Serves as a Pinch Bar When the Adjustable Lower Jaw is Removed: It is Made from Forged Steel

Using Liquid Manure

Most gardeners do not use liquid manure because they do not know how to prepare it. This form of fertilizer has the advantage of being "quick," because the soluble plant-food elements are carried directly to the roots.

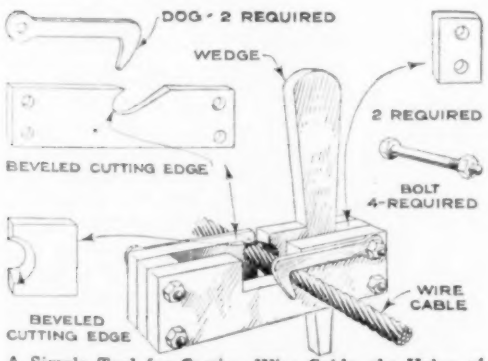
The first requisite in the preparation of liquid manure is a water-tight barrel. The fertilizer is made by filling the barrel half or three-fourths full of water and then suspending in it, from a stick across the top, a burlap bag filled with any available animal manure.

It is inevitable that the solution, thus prepared, will vary greatly in strength. No rules for dilution can be laid down, however, but it must be diluted with

water until it is about the color of weak tea, or some crops will be actually damaged by its application—"burnt," as the expression has it. The barrel containing the liquid manure can be transported from one point to another by using a simple wooden frame which consists of two long pieces forming handles joined together near the center by two cross-pieces. The opening thus formed should be slightly narrower than the widest diameter of the barrel. With this arrangement it is not necessary to attach the carrier to the barrel, and when not in use, it drops to the ground.—John T. Bartlett, Boulder, Colo.

A Fixture for Cutting Wire Cable

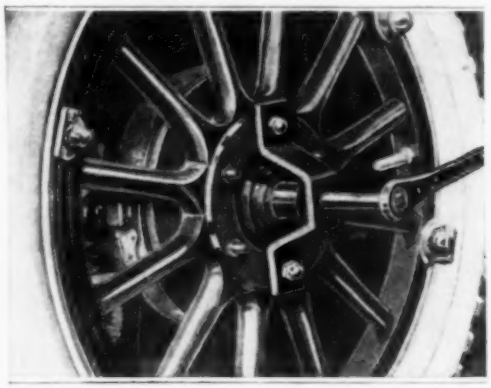
The drawing shows a tool whose value can best be appreciated by loggers, seamen, and miners, as, with it, a wire cable of ordinary dimensions can be easily cut. The frame is made of tool steel and one side is provided with a cutting edge which acts as a shear blade; this cutting edge is beveled and tempered. The opposite frame member, which may be of mild steel, is provided with an opening to permit movement of the cable. The frame is assembled by placing spacers at each end and bolting, as shown; this will leave an opening in the center for the insertion of the sliding cutter and wedge. The cutter is made of tool steel with a beveled, semicircular cutting edge, which is hardened and tempered. The dogs at the sides prevent the cable from bending while it is being cut. Both the wedge and the cutter should fit snugly, without sideplay, and plenty of oil should be used when making a cut. The cutter is operated by placing the cable between the two cutters and driving the wedge in behind the sliding cutter with a sledge hammer.—Chas. O. Olsen, Portland, Ore.



A Simple Tool for Cutting Wire Cable, the Value of Which will be Appreciated by Seamen and Lumbermen

A Wheel Puller for Full-Floating Rear Axles

To pull an automobile rear wheel from a full-floating axle is not quite so easy as



Pulling a Wheel from a Full-Floating Axle Is Easy When a Suitable Tool is Applied; the Illustration Shows a Simple Tool for This Purpose

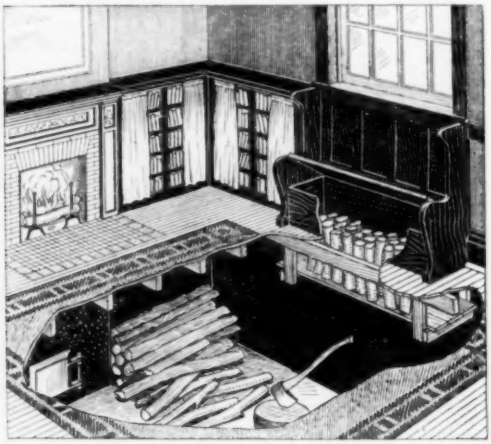
with the simpler types of rear axle, since the common wheel puller does not fit the job. Determined to make this work easy, once for all, one owner of a car of this type made a puller especially to fit his car, and the tool has since then relieved him of all difficulties in removing wheels. It consists of a screw, fitted with a handle working in a piece of heavy bar iron, which is drilled and tapped for the screw, and which also has two slotted holes near the ends. A hardwood cylinder, turned with a shoulder, completes the outfit; the cylinder is of a size to fit inside the wheel hub, and to bear directly against the axle shaft, as shown. Two of the screws around the hub of the wheel are removed, and replaced after passing them through the holes in the puller. Screwing up, as usual, removes the wheel, without danger of damage to any part of the hub.

Protecting Painted Walls from Dirt

Means for protecting a coat of paint, in kitchens, and simplifying the task of cleaning, is afforded by the use of a thin solution of starch and water. The starch solution is applied over the paint, after it has dried; this will detract somewhat from the gloss of the paint, but all dirt, grease, and smoke will adhere to the starch instead of to the paint, and when cleaning time arrives, the starch coating can be washed off, removing the dirt along with it. By applying another coat of starch, the paint will be kept fresh for a long time.—Chas. Waller, Chicago, Ill.

A Wood Box under Window Seat

To eliminate the unnecessary handling of wood, a home builder installed a wood

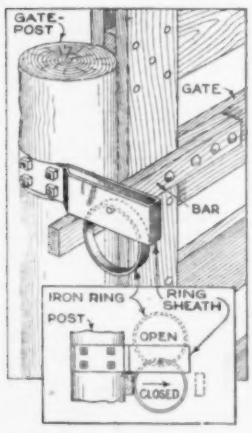


A Hole in the Basement Ceiling Enables a Householder to Fill His Parlor Wood Box without a Journey Upstairs

box, or rack, under a settee in his parlor, with a hinged seat which served as the lid of the box. An opening in the floor connected the box with the basement, so that fresh wood could be supplied from below without the need of a trip upstairs. In addition to saving labor, the device greatly simplified the work of keeping the home clean.—Otto Merker, Groton, Conn.

Iron-Ring Gate Latch

A positive-locking gate latch that does not allow the gate to fly back when slammed shut, and cannot be nosed open by stock, is made as shown in the drawing. A ring sheath of flat iron is made, and attached to the gatepost; a pin through this sheath holds a metal ring in such a manner that any pull against the gate causes the ring to be pressed tightly against the sheath. When the gate is closed, the wooden bar strikes the ring and throws it up out of the way until it is in position, when the ring immediately falls and locks the gate. —Roy H. Poston, St. Francois, Mo.

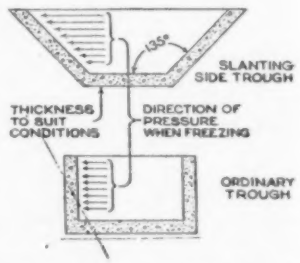


Repair for Bitbrace Handle

If the wooden head of a bitbrace becomes broken, an ordinary door knob will usually serve as a substitute, by making a shallow groove in the brace stock to correspond with the setscrew in the shank of the knob; this will prevent the knob from coming off and, at the same time, permit it to turn freely. If the brace is of the ball-bearing variety, allowance should be made, when fitting the knob, for sufficient room for the bearing at the top of the brace stock. A small oilhole may be drilled through the knob shank, just above the setscrew.—Edward S. Perrine, Girard, Ill.

Concrete Trough That will Not Burst When Frozen

Concrete water troughs and tanks which have upright sides are nearly always damaged when water freezes in them. The reason for this is that the pressure caused by the freezing exerts its total force horizontally against the walls and pushes them outward. A trough made with slanting walls, as shown in the drawing, is much less liable to burst, since the pressure is exerted over a much larger area, and part of it tends to push the ice upward. The side walls should meet the bottom of the trough at an angle of about 135°. Very large troughs or tanks made in this way need not be emptied, as they practically never break from freezing.



Setting Bolts in Rock and Concrete

To secure iron bolts in rock or concrete, sulphur is the cheapest material and one of the best, but unless certain precautions are observed, the results will be unsatisfactory. Drill a hole for the bolt with a star drill of the same diameter as that of the bolt head. For bolts larger than ⅜ in., the hole should be at least 3 in. deep. Dry out the hole by means of a gasoline torch, or by dropping a hot bolt into it.

The sulphur should be heated slowly in a melting pot. If it should catch fire, smother it. Sulphur melts at about 246°

F., and at this temperature is a thin liquid, but when heated to about 320° it becomes very thick, making it hard to pour from the ladle. Therefore, the sulphur should be heated until it is all melted, when it will be quite thick. Remove the pot from the fire and allow the sulphur to cool until it becomes thin enough to pour into the hole into which the bolt has already been placed.

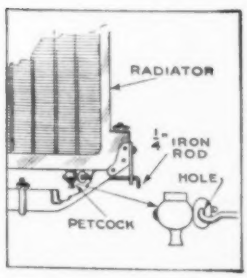
To fasten bolts in a concrete ceiling, where sulphur cannot be used, a thick paste of litharge and glycerin is used.—Ben Buck, San Francisco, Calif.

Increasing the Height of a Chimney While in Use

A contractor undertook to add to the height of a brick smokestack without interfering with its daily use, and the job was successfully accomplished in an original manner. A large opening was made in one side of the square stack, somewhat below the top; 5-in. spikes were driven into the masonry, 5 or 6 in. below the mouth of the stack, and several pieces of corrugated sheet iron, of the proper length, were supported by these spikes, thus completely closing the top of the stack and forcing the smoke out of the side opening. After this preparatory work had been completed, the masons were brought on the job and the work of adding to the stack was completed. Afterward the pieces of sheet iron were removed through the opening underneath, which was then bricked up.

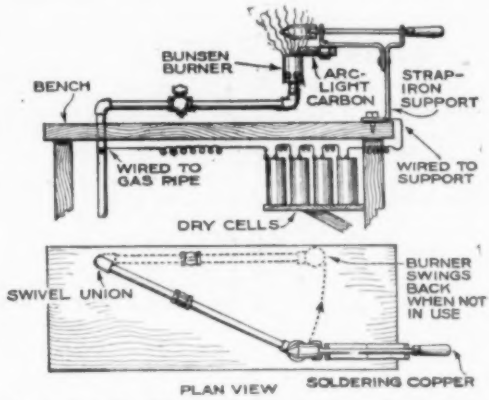
Draining the Radiator Made Easy

A piece of iron rod properly applied to the drain cock of an automobile radiator eliminates the contortions and inconvenience of draining the radiator, as it is normally done. As shown in the drawing, a hole is drilled in the handle of the drain cock and one end of a piece of iron rod is inserted and bent into an eye; this rod is carried out beyond the frame, from which it is supported by a 3-in. length of flat iron bolted to the frame, as indicated. A handle is formed on the outer end of the rod, and as this is in an exposed location, the drain cock may be opened without difficulty.



Electrically Lighted Fixture Keeps Soldering Bit Hot

For the repairman who requires a hot soldering bit at intervals during the day,



An Automatic Electric Lighter for a Gas Soldering-Bit Heater. The Burner Swings Back against the Wall and Leaves the Bench Clear for Other Work

the arrangement shown in the drawing will prove decidedly convenient. An ordinary Bunsen burner is attached to a swinging pipe which is connected to the gas supply by a swivel union, as shown. A support for the soldering bit is made from pieces of flat iron, and is bolted to the bench in such a position that the burner can be swung in under the point of the bit. A clamp on the underside of the support is provided to hold a piece of arc-light carbon.

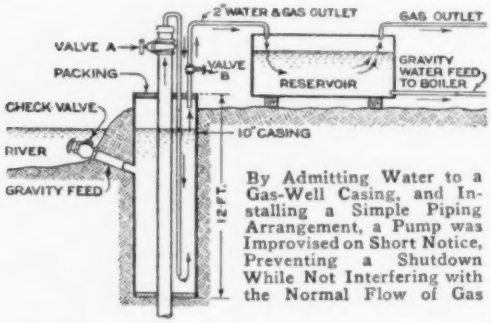
To supply current, four to six dry cells are connected to the separate parts of the arrangement, as indicated, the wires being soldered to the metal parts. Swinging the burner, with the gas turned on, so that contact is made with the arc-lamp carbon, a spark is produced which lights the gas instantly. The burner should be so arranged that it will not be in steady contact with the carbon, to avoid discharging the battery. When the burner is swung back against the wall, the bench top is clear for other work, the stand not being much in the way.

Coke as a Substitute for Sandpaper

A sandpaper substitute, that has special merit for removing rust from tools without scratching, is made from crushed coke. The coke is crushed to the required degree of fineness and sifted through a piece of cloth onto a piece of coarse paper which has been coated with glue. After the glue has dried, the paper is ready for use.

Natural-Gas Flow Operates Improvised Water Pump

A satisfactory pumping arrangement was devised in a West Virginia gas field



By Admitting Water to a Gas-Well Casing, and Installing a Simple Piping Arrangement, a Pump was Improvised on Short Notice, Preventing a Shutdown While Not Interfering with the Normal Flow of Gas

recently when a tie-up of local railroads deprived several drillers of the pump which was to have raised water from a near-by river to the boilers of their engines. They first laid a gravity-feed pipe from the river to the 10-in. air and water-tight casing, that surrounds one of the gas wells of the vicinity for 12 ft. before its emergence from the ground. From the main gas valve one pipe was sunk to the bottom of this casing; another was led from the top of the casing to the top of a water tank placed above the boilers. River water was then admitted to the casing through the gravity pipe. Now the gas valve was opened. Under high pressure, the gas passed down through the first pipe, and up through the water; out of the second pipe, into the water tank, and then out through a pipe in the top of the tank. As it traveled this route, the gas carried with it, as a fine spray, a steady flow of water. This fell into, and soon filled, the tank.

Had the main object been to pump the water, without at the same time allowing the gas to flow, the water-outlet pipe would have been run down to the lower position and the gas pipe cut off just inside the casing, to allow the gas pressure to act on the water.

An Emergency Babbitt Ladle

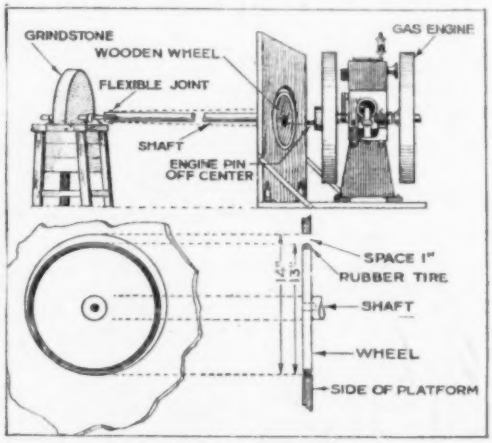
For the infrequent pouring of babbitt bearings in the home garage, or shop, an old hub cap can be used, if the quantity of metal to be poured is not large. A hole is drilled through one side of the cap and a threaded rod is secured by nuts on both sides. For convenience in pouring, a lip can be formed with a hammer. A discarded piston can be similarly used by passing a threaded rod through the piston-pin hole and using nuts and washers. A notch, filed or ground into the rim of the piston, serves as a pouring lip.

Internal Friction Wheel Gives High Speed Reduction

A simple method of driving some slow-speed machine, such as a grindstone, by an engine without the use of belts or countershafts, is shown in the illustration.

Referring to the drawing it will be observed that the connecting shaft is attached to the center of the wooden wheel which has a round rubber tire, about ½ in. in diameter, fitted to its circumference. A hole is drilled in the center of the wheel, to engage with the pin on the end of the engine crankshaft, as indicated; this pin is set ½ in. off center, so that it will force the wheel against the edge of the circular opening in the upright board. The engine is set on the platform so that the center of the shaft lines up with the center of the opening. The board platform and upright are hinged together to permit their being folded together when not in use, and are fitted with angular braces, as shown. If the engine is once lined up, it can be easily removed and replaced without disturbing the alinement.

This arrangement gives a ratio of 13 to 1, or a reduction in speed from 550 r.p.m. to slightly more than 40. With a reduction gear of this character, the driven machine must be equipped with a flexible coupling, as shown, in order to offset the vibration of the shaft.—Philip G. Bernholz, E. Orange, N. J.



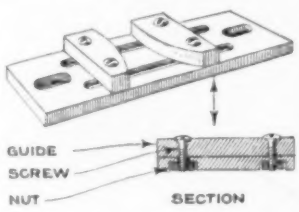
This Method of Obtaining Speed Reduction Employs No Shafts, Pulleys, or Belts. It Reduces Speed from 150 Revolutions to Slightly More than 40

Varnishing the Automobile Engine Hood

The hood over the engine of an automobile rapidly loses its luster while the finish of the remainder of the car is still in good condition. Revarnishing the hood is best accomplished when the motor is warm. Scour the hood thoroughly with a handful of curled hair, and apply the varnish immediately after dusting, or wiping, off the surface. The advantage of applying the varnish while the hood is warm is that the varnish flows and spreads evenly, and dries without brush marks.

Adjustable Stock Guide for the Punch Press

Users of punch presses will be able to save considerably on tool steel by equipping their machines with the stock guide shown in the drawing. Attached to the bed of the press, guides of this character serve as a tool extension and inasmuch as they are adjustable, one guide will suffice for working with different sets of dies.—E. E. Hansen, New Britain, Conn.

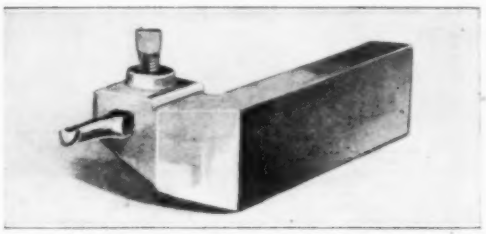


One-Horse Manure Scraper

The job of raking up manure on feed lots, for transportation to the manure pit, is anything but a pleasant job, as those who have done it will testify. The scraper shown in the drawing was made from a piece of sheet iron, 10 in. by 3 ft., which is curved for its whole length and bolted to an ordinary plow stock. The bottom edge of the scraper was sharpened for removing manure closely compacted with the earth. A horse or mule is hitched to the scraper, and the animal is driven to the manure dump.

Holder for Small Boring Tools

On small boring jobs in the lathe, it is often convenient to use a tool made



A Small Boring Tool, Formed from High-Speed Steel Stock by Grinding, without Forge Work, Is Convenient When Held in a Holder of This Design

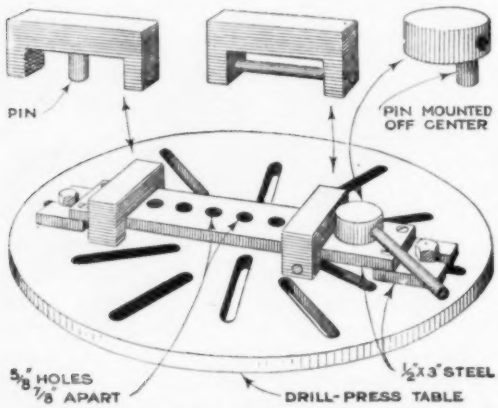
by grinding a piece of high-speed steel to the proper shape. A machinist can shape a tool from the bar more cheaply than it can be forged, and it can be shaped quite accurately on the grinding wheel. For holding, an offset holder of the type illustrated is convenient. It is made of a piece of mild steel, 2 by 2 by 6 in. in size. It is sawed to shape on the milling machine, and the hole for the tool is drilled by holding a drill in the chuck, and feeding against it the lathe carriage, with the tool holder held in the tool post. This makes the hole exactly central for height, and also insures that the tool will be held level; both of these points are quite important. The hole is then filed or broached square, to fit the tool loosely. It is well to drill the setscrew hole in the lathe, with the holder gripped in a four-jawed chuck. It can then be tapped, and some metal turned off to form a boss around the setscrew.

Repairing Broken Gears with Horseshoe Toe Calks

While operating a tractor, the iron handle on the end of the furrow-guide lifting rope fell into the drivewheel gears and broke off two of the teeth. Rather than suffer a long delay while waiting for a new wheel, the broken teeth were repaired with screw calks. The face of the wheel was 3 in. wide, and two holes were drilled into each of the broken teeth; these holes were tapped, and the calks from a set of old horseshoes were inserted after the threads had been recut to correspond with the holes in the wheel. After the calks had been screwed into place, the corners at the base were dressed off to conform with the teeth of the other gear. This repair was done without even removing the wheel from the tractor.—George G. McVicker, North Bend, Neb.

A Simple Drill Vise

A very efficient, quick-opening and closing vise for the drill-press table, is

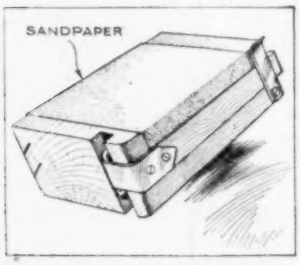


An Efficient and Easily Made Vise, Which can be Quickly Adjusted and Operated

shown in the drawing. The steel bar which forms the bed of the device is provided with holes at regular intervals and supported from the drill-press table, at the ends, by pieces of the same stock, provided with slots for bolting to the table. The jaws are movable on the bar, the fixed one having a pin driven into it which fits into the holes; the movable jaw is held in place by a horizontal pin riveted to the sides, as shown. The cam consists of a disk of steel shafting into one face of which a pin, to fit the holes in the bar, is driven eccentrically. At right angles to this pin a handle is inserted into a hole in the circumference of the cam.—C. H. Willey, Concord, N. H.

A Handy Sanding Block

The accompanying drawing illustrates the construction of a sanding block of unusual merit. As the fingers do not come into contact with the rough surface of the abrasive, sore fingers are eliminated. The device is constructed from a hardwood block, with slanting grooves cut on one side, as shown, to hold one edge of the paper, which is brought around underneath the block and held on the other side by the clamp; this is hinged at one end, a latch at the opposite end serving to keep the clamp in place.—E. K. Wehry, Cedar Rapids, Ia.



Making Compass Leads

By reducing the diameter of leads from common pencils, the draftsman can make his own compass leads. This is done by laying a pencil pointer on the table, holding another in one hand, and rolling the lead back and forth between the two sandpaper surfaces.—Earl Stevens, Niagara Falls, N. Y.

A Neat Window Cooler

Instead of the usual full-length storm sash, the window shown in the illustration is in two sections. The upper half is attached with buttons in the usual manner, but the lower half is set out about 8 in. from the window sill and is boxed in tightly; this forms a clean, cool, covered shelf, about 12 in. deep, to which the lower sash of the inner window forms a close-fitting glass door that may be raised or lowered as desired. With a sash curtain in place, the appearance of the window cooler is as neat as though it served only its usual purpose, and very little light is excluded by the arrangement. From early fall until the last spring frosts, this arrangement makes an excellent and satisfactory substitute for the refrigerator.—Rubie Franklin, Rochester, Minn.

The Making of Amber Varnish

Amber gum is a well-known commercial product, and is used principally for the manufacture of pipe stems, cigar tubes, beads, etc.; also in the manufacture of very high-grade, hard, and durable varnish. Gum amber is a fossil resin and is the hardest, most resistant and beautiful of all gums.

To convert this gum into varnish it must first be made liquid, or melted, which requires a temperature of 500 or 600° F. To melt amber successfully a good

crucible holding about 1 qt. is required. The crucible should have a stiff wire holder for removing it from the fire, and a short steel rod driven into a wooden handle is also required for stirring the melting gum. Scrap amber is thrown into the crucible with no regard to color unless some particular result is sought. The best means of heating is to build a good coal fire in the kitchen range with the coals coming close to the top of the open hole. After the gum has been placed in the crucible, it is sunk well down into the hot coals. From the time the crucible is placed in the fire particular care must be exercised to prevent the melting mass from becoming hot enough to catch fire. If this should happen, the crucible may be lifted from the fire and the flame blown out, after which it is replaced over the fire. The melting mass should be stirred constantly. When the gum is entirely melted, it is removed from the fire and allowed to cool to the point where a drop of oil does not cause it to blaze up. Then add drop by drop enough of the best boiled linseed oil to reduce the mass to the proper consistency. Some charges of gum will require more oil than others, but by rubbing a drop of the varnish on a piece of polished wood and allowing it to cool, the proper fluidity can be observed, meanwhile keeping the crucible of varnish hot. When the varnish attains the proper consistency, it should be strained while hot through a very fine wire strainer, preferably more than once. Amber varnish may be almost white or it may be any shade between that and the rich wine color of costly pipe stems. The color will be varied somewhat by the degree of heat required to melt the gum, the length of time it is cooked after melting, and by the original color of the gum used.

Skin Infections Caused by Oils and Grease

The practice of washing the hands in oil or grease, common among workmen in industrial establishments, is responsible for many mysterious epidemics of boils, eczema, and other skin diseases, according to the Department of Labor.

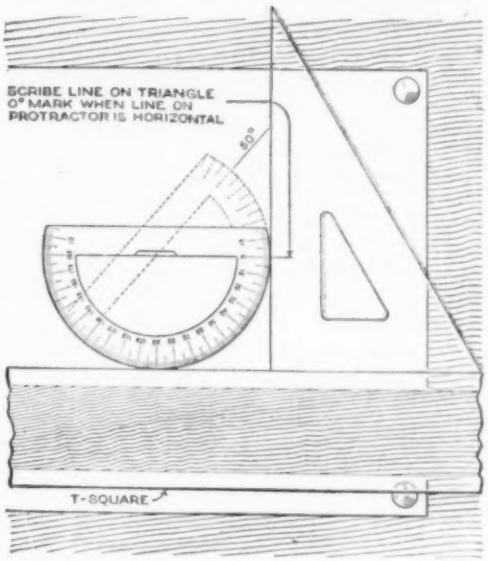
The grease or oils, as they come to the plant, do not contain any bacteria, but become contaminated after being handled by employes having pus infections on their hands or arms.

The use of gloves by workmen who handle grease is recommended, and frequent cleansing of the hands with warm water and good soap.

Using the Protractor

A handier method of using the protractor than that usually employed is shown in the illustration.

The protractor and a triangle are placed

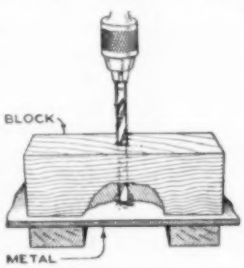


A Method of Using a Protractor, Which Is in Some Respects Handier than the Usual One

upon the T-square as shown, and a mark is made upon the triangle corresponding to the zero mark on the protractor, when the latter is in a perfectly horizontal position. Now, by keeping the T-square and triangle in the same relative position, lines may be drawn with the straight edge of the protractor, the angles being found by simply rotating the protractor until the proper graduation coincides with the mark on the triangle.—C. B. Smith, Indianapolis, Ind.

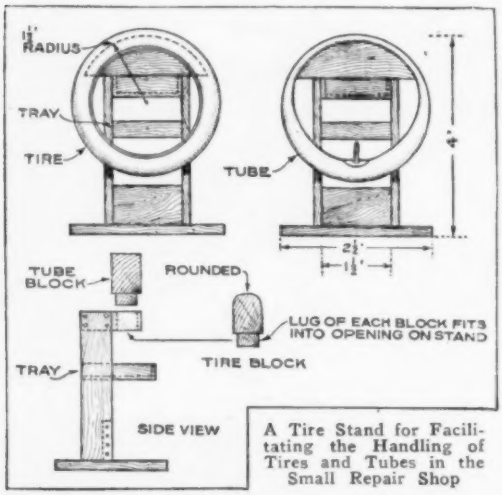
Reducing Breakage of Small Drills

The breakage of small drills caused by too great downward pressure in drilling, can be largely reduced. A wooden block, of sufficient thickness to allow the drill to extend through the underside, is drilled; this is then laid on the work, as shown in the drawing. The block will serve not only to absorb most of the side strain but also to steady the drill.



Tire-Repair Stand

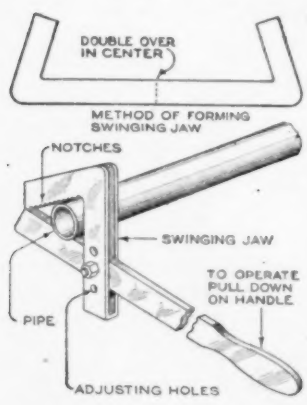
A tire stand that facilitates the handling of tires and tubes in the small tire-repair shop, is shown in the drawing. As the whole device is made from wood, it is easily built. The stand consists of a framed support and two semicircular blocks; one of the blocks has a flat face, for use in repairing tubes, and the face of the other is rounded to conform to the inside of a cover placed over it for repair. A lug on the bottom of each block fits into an opening provided in the top of the stand, so that they are readily interchangeable.



A Tire Stand for Facilitating the Handling of Tires and Tubes in the Small Repair Shop

A Homemade Pipe Wrench

A homemade pipe wrench that has some advantages over the purchased article is shown in the drawing. The upper jaw is free to swing and is provided with holes for adjustment, although a wide range of pipe sizes can be accommodated in each position of the jaw. With the exception of the bolt all parts are made from flat steel. The jaw is made by bending over the ends, as shown, and then bending at the center; notches are filed in the underside, and if possible, this part of the wrench is hardened to minimize wear.—R. H. Kasper, Philadelphia, Pennsylvania.

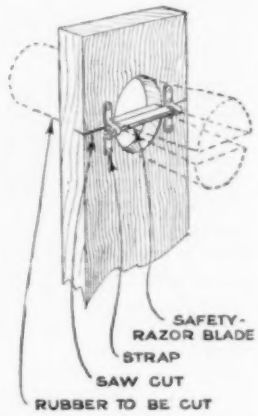


Ruling Lines with Cross-Section Paper

Common cross-section paper can be made to help very materially in properly spacing lines that are to be drawn parallel with each other, regardless of the distance between lines. A strip of the paper is used as a guide on the edge of the area to be ruled. The distance between the lines can be varied by changing the angle of the line from which one works, either by moving the cross-section paper or by using different triangles.—Frank W. Roth, Joplin, Mo.

Fixture for Splitting Round Rubber

Almost everyone knows the difficulty of attaching round rubber to a flat surface so as to make a neat job, and splitting the rubber so that the cut surface will be even is also difficult. The simple fixture illustrated herewith shows how the latter can be done quickly and neatly. A hole to accommodate the rubber is drilled in a board, and an old razor blade is fastened securely into a groove provided for it on one side. The operation is started by slitting the rubber for a few inches with a knife and then inserting it in the fixture and pulling it through from the back.—Frank Jablecnik, Chicago, Ill.



Painting Screens with a Sponge

Wire screens can be painted more easily and with better results than by the ordinary method of painting with a brush, if the paint is thinned and applied to the screen with an old sponge.—Edward B. Zolle, Jersey City, N. J.

¶A heat-resisting cement is made of equal parts of manganese peroxide and zinc white, mixed with water glass, or sodium silicate.

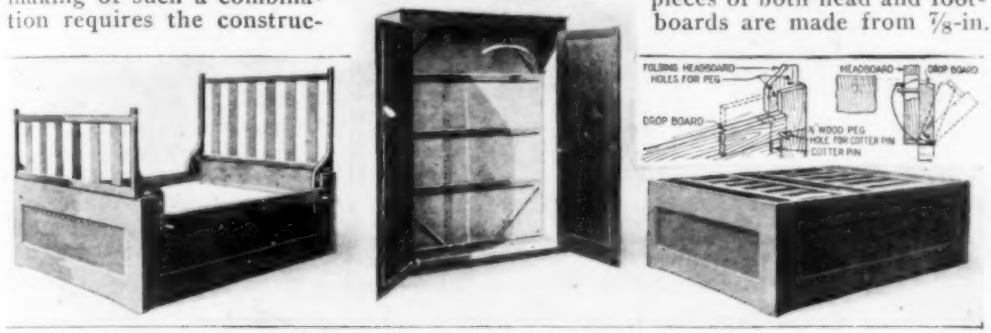
Amateur Mechanics
Information as to where to obtain any specified materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

Combination Bed and Wardrobe

BY J. M. SNAVELY

A COMBINATION of bed and wardrobe is shown in the photographs. The making of such a combination requires the construction of a substantial, though light, wooden cabinet and, as such a cabinet must be built to fit the bedspring to be used in connection with it, no definite dimensions can be given. The cabinet shown has a depth of 2 ft. The framework and doors are made of ⅞-in. material, joined together at the corners with glue and screws. The panels are ⅜ in. thick. Thirteen inches is allowed for the depth of the wardrobe section, which is separated from the bed section by a light partition that supports the bed. Strips are attached to each of the four sides and secured to these are the horizontal slats and corner braces shown in the central photograph; all of these pieces are also of ⅞-in. material. In order to conceal the bed when the doors are opened, this partition is covered with wallboard. The wardrobe doors are held in place by bolts at top and bottom, which are connected to the knob at the center by rods in such a manner that a half turn of the knob locks or unlocks the doors. Arrangements for hanging the clothing complete the wardrobe section.

Hinged drop boards are provided on each side, being made of the same material as the cabinet frame and attached to it with three butt hinges; the purpose of these boards will be described later. The end uprights and horizontal crosspieces of both head and footboards are made from ⅞-in. material, while the upright slats are ⅜-in. thick. The endpieces of both head and footboards are made sufficiently long, so that they may be attached inside the frame with long screws. The point of attachment is quite important, as it is desirable that the bottom bars of the head and footboards should rest upon the edge of the cabinet frame, as shown in the photograph at the left, when raised; also, when lowered, the head and footboards should come flush with the edges of the cabinet, as shown in the photograph at the right.



An Ingenious Cabinetmaker Is Responsible for This Combination Bed and Wardrobe. The Photograph at the Left Shows Everything Ready for Making Up a Comfortable Bed. The Central Picture Gives an Idea of Its Appearance When Used as a Wardrobe; the Picture at the Right Shows the Manner in Which the Head and Footboards Fold into the Cabinet

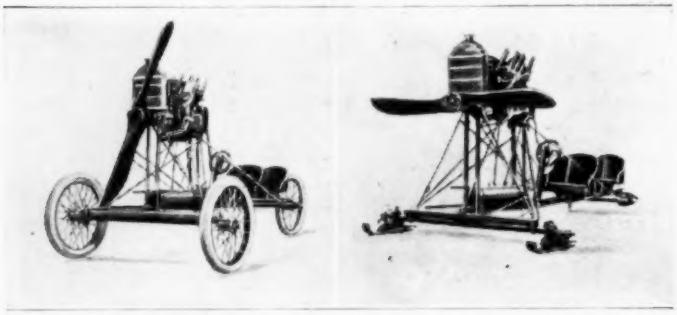
The hinged drop boards already referred to, are provided with stout pins at each inside end, as shown in the detail drawing at the right. When the head and footboards are lowered, these pins fit into holes drilled into the endpieces, and hold them securely when the cabinet is stood on its end during the day for use as a wardrobe. In addition to securing the head and footboards, the bedclothing and springs are also held in place.

¶An extra dry cell or two can be carried along inside the spare tire, in case of emergency; these may be connected to the taillight when the charge in the storage battery runs low.

Wind Wagon Convertible to Ice Boat

A wind wagon, propelled by an airplane propeller, can be used at all seasons of the year if equipped as shown.

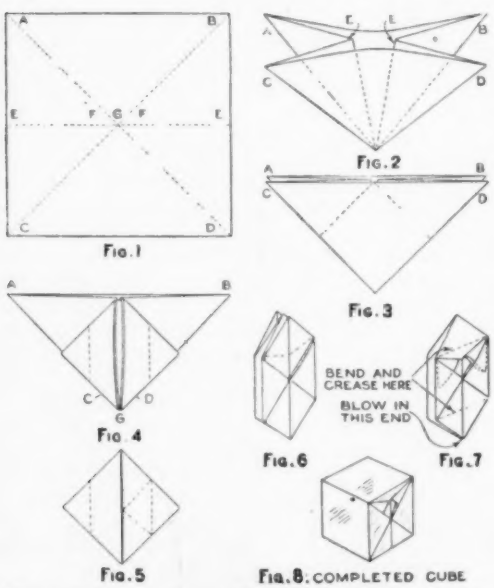
Most of the parts involved in the construction of the vehicle, such as the fuel tank, engine, front axle, radiator, and a few other parts, were taken bodily from a light automobile. The engine and bucket seats are attached to a strong wooden beam, running at right angles to the front axle, provision being made at the outer extremity for the attachment of a single wheel. The engine is mounted on a strong tubular-steel frame, which is suitably braced, so as to provide ample clearance for the 5-ft. propeller. A steering wheel in front of the driver is connected to the steering knuckles on the front axle by flexible steel cables, which are attached to a drum on the steering wheel somewhat after the fashion of the steering apparatus of a motorboat. In summertime, or, as desired, the vehicle is equipped with three pneumatic-tired wheels, but for use in winter, or on the ice, the wheels are removed and replaced by runners.



A Wind Wagon Built for Year-Round Service: The Pneumatic-Tired Wheels Shown in the Photograph at the Left are Removed and Substituted by Runners for Use in Winter

Paper Cubes That "Blow Up"

Paper cubes, or boxes, that will provide considerable amusement for the children, are easily made. A square piece of paper is folded, as shown by the dotted lines in Fig. 1, from points A to D and from B to C. The paper is spread out and folded on the opposite side from points E to F. The square of paper is again spread out and folded into the form shown in Figs. 2 and 3. The corners A, B, C, and D are folded on the dotted lines shown in Fig. 3, to the center G in Fig. 4. When all four corners have been folded, the paper will appear as shown in Fig. 5. The four corners are folded toward the center, as indicated by the dotted lines in Fig. 5. When this is done the paper will appear as in Fig. 6. The corners A, B, C, and D are bent on the dotted lines in Fig. 6 and folded inside the flap, as in Fig. 7. When the paper has been folded into the form shown in Fig. 7, a hole will be left at one end, and the cube, or box, is expanded by blowing into it. The inflated cube is shown in Fig. 8.—D. George Logan, Jr., Pittsburgh, Pa.



Paper Cubes, or Boxes, That "Blow Up," are Easily Made from Square Pieces of Paper. The Illustration Shows the Various Steps in Construction

Plumb Bob Indicates Position of Car

Various devices, such as marks on the wall and floor, are used, in garages of limited space, to indicate where the car should be stopped in order to get the proper clearance for closing the doors. A very convenient arrangement for this purpose is a plumb bob, which can be made from any small, heavy object, suspended from the ceiling by a string or wire. The plumb bob is hung in such a position that when it is touching the radiator, or the

radiator-filler cap, the car will be properly spotted. The bob is always visible and never in the way.—A. Swanson, Okmulgee, Okla.

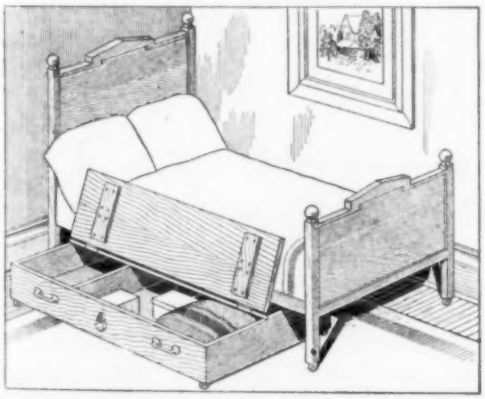
Making Bubbles Carry Paper Figures

To make soap bubbles that will carry small paper figures is an interesting pastime. A solution made of soap shavings and water, with glycerin in the proportion of one-third, is used. The solution is placed in a bottle and shaken up until the soap has dissolved, and is allowed to stand until it settles, the clear liquid at the top being used for blowing the bubbles.

The figures are cut from tissue paper and a short piece of thread is attached through the top. The other end of the thread is knotted through a disk of very thin paper. It is best to blow the bubble through a glass tube, and when a bubble of the desired size has been formed, place the paper disk on one side; this will at once slip to the bottom. Shake the bubble off and it starts on its aerial journey carrying the paper figure.—S. Leonard Bastin, Bournemouth, Eng.

Clothes Chest for the Small Apartment

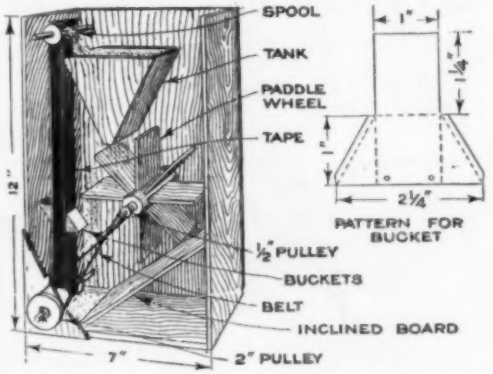
Modern apartments are characterized by a minimum of storage space, and the drawing shows how one of our present-day cliff dwellers solved the storage problem by utilizing the space underneath the bed. A light wooden box, mounted on ball-bearing casters, and provided with a cover hinged at the center, to protect the contents, was made as shown in the drawing. When not in use the box remains concealed underneath the bed.—Roscoe P. Guilbert, Racine, Wis.



A Clothes Chest, Which Pulls from Beneath the Bed at a Touch, Helps to Overcome Scarcity of Storage Space

A Toy Sand Motor

A sand motor that will operate toy machinery, and cost nothing to operate, will



A Toy Motor, That is Operated by the Weight of Sand Falling on the Blades of a Paddle Wheel: This Motor will Run for Upward of Half an Hour without Stopping

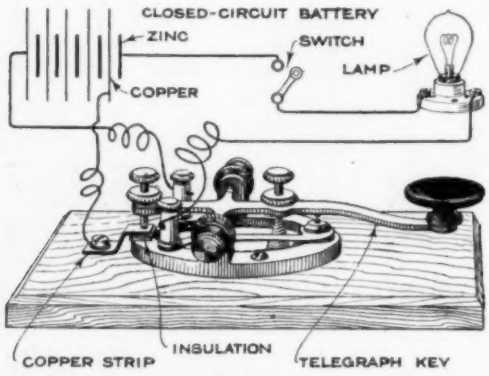
interest any child, particularly when the motor will run continuously for a half hour without stopping. As shown in the drawing, the parts of the motor are simple, and consist of an elevated reservoir containing sand arranged so that a stream of sand running through an opening in the bottom operates the paddle wheel immediately below. An inclined board, underneath the wheel, piles up the sand in the corner so that it can be scooped up by the bucket conveyor and returned to the sand bin. The bucket conveyor consists of three small scoops made from tin, according to the pattern shown, and sewed to a piece of tape. The size of the pulley on the conveyor shaft should be about four times that of the one on the end of the paddle-wheel shaft. Both pulleys are connected with a string belt. With the exception of the conveyor and buckets, the whole machine can be made from cigar boxes, spools, and glue.—Wayne Leyrer, Atlantic City, N. J.

Place Cards Made from Nuts

Odd little baskets that may be put to a variety of uses can be made from various nuts and seeds by cutting a segment from each side with a pocketknife, or a fine metal-cutting saw, leaving a strip of shell to form a handle. The kernel and fiber are then scooped out. Such baskets can be used for watch charms or, by attaching them to a card with a drop of glue and filling the basket with a small souvenir, they form attractive place cards.—Cora Hamilton, Binghamton, N. Y.

Improved Telegraph Blinker

The least expensive method of communicating at night, between points within sight of each other, is by blinker tele-



By Means of the Apparatus Illustrated, an Almost Instantaneous Lighting Effect is Obtained, Enabling Signals to be Rapidly Sent

graph; a system whereby a miniature electric lamp, mounted on a housetop, tree, or other elevated location, is "blinked," in dots and dashes, by an ordinary telegraph key in the house, or from any position where the operator may keep the light of the distant station in view. Lamps may be bought for a few cents that will not require more than four or five cells to light them. Light in an electric lamp is caused by the current passing through the lamp filament with a little more force behind it than the filament is capable of handling with ease. Naturally, it takes a little time for the current to heat up the filament, as well as for the light to completely disappear after the current ceases to flow. Should the lamp be connected directly in series with the key and battery the signals must be slow, to allow time for the filament to heat sufficiently to make a light. If, however, a single cell is always kept in series when the key is open, the lamp filament will be kept partly heated, although not enough to make a light. This arrangement allows almost instantaneous lighting when the full power of the battery is turned on by depressing the key, and greatly increases the speed of signaling.

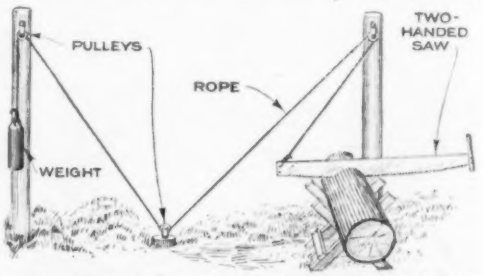
As shown in the drawing, an ordinary telegraph key is used, but a back contact, which consists of a strip of copper, bent to the shape shown, is necessary; this contact is insulated from the key and screwed to the instrument base, as indicated. A wire from the back contact is connected to the copper electrode of a single cell, as shown. When at rest, the key is resting upon the back contact, which allows a relatively weak current from the one cell to flow through the key lever to the lamp and thence back to the cell. When the key is depressed, to make a signal, the back contact is broken and the united strength of the whole battery flows through the lamp, causing it to light.

Closed-circuit, or gravity, cells should be used in this hook-up, and the end cell interchanged with one of the others, at intervals, so that it will not be overworked. Perhaps the best battery for the purpose, and the easiest obtainable, is the familiar "crowfoot," with zinc and copper electrodes immersed in a solution of blue vitriol and water. A switch may be inserted in the circuit, between the lamp and the first cell, so that the latter may rest when the apparatus is not in use.—Samuel W. Beach, Washington, D. C.

Device Enables Crosscut Saw to be Used by One Man

A device which enables one man to use a crosscut saw is shown in the illustration. Two posts are driven into the ground about 6 ft. apart. Near the top of each of these is fastened a pulley, and midway between the posts is fastened another pulley, as shown. A sawhorse is placed beside one of the posts, the handle removed from one end of the saw, and the end of a rope passed through one of the bolt holes and tied.

The other end is passed over the pulley on the first post, under the center pulley,



A Two-Handed Crosscut Saw is Easily Handled by One Man If This Rigging is Used

over the pulley on the other post, and a heavy counterweight is then fastened to it. With this arrangement, the saw may be easily handled by one man.

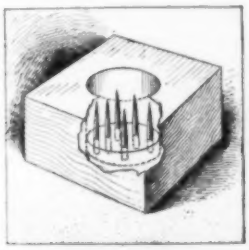
¶Cedar-pencil shavings, from pencil sharpeners, put into small bags and packed away with clothing, will prevent the inroads of moths.

Tightening a Cane Chair Seat

After a period of use the seats of cane-bottomed chairs begin to sag down in the middle. Such seats can be tightened by sponging the cane bottom with very hot water. The hot-water treatment is continued until the cane is thoroughly soaked; then the chair is set outdoors, in the sun if possible, or in a place where there is a strong draft, as the faster the cane is dried, the greater will be the shrinkage. Naturally, this method cannot be used without more or less damage to the finish of the article, unless the cane surface is unfinished.

A Simple Cigar Perforator

Instead of clipping, or biting, the end off the cigar, and thereby shortening the length of the smoke, the end can be perforated. The perforator shown in the drawing consists of a small wooden block and several phonograph needles. A $\frac{5}{8}$-in. hole is drilled partly through the block, and several needles are driven through from the bottom. The end of the cigar is inserted into the hole and pushed against the needles, which perforate the wrapper and allow the smoke to pass. This device is very desirable when used with cigars that are made with a short filler.



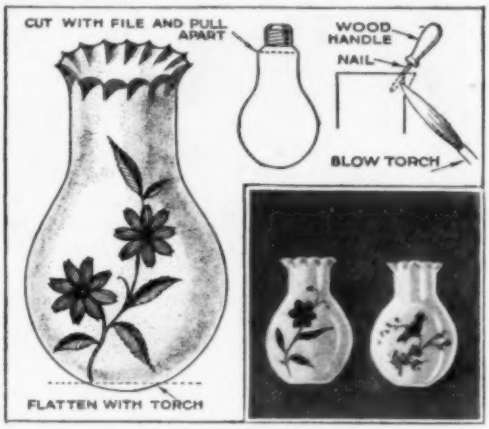
Printing from Cracked Negatives

To make a good print from cracked glass negatives, if the film remains unbroken, is not impossible, if some form of printing-out paper is used. Fasten a string to each corner of the printing frame and tie the loose ends together, a foot or so above the frame. The printing frame is suspended from a nail or hook, and the cords are twisted together, so that the weight of the frame will untwist them and revolve the frame. The secret of it is that the light is evenly distributed over every part of the revolving printing negative, instead of coming from only one direction as when printing from an uncracked negative.

¶Kerosene oil, to which a few drops of ammonia are added, makes a good cleaner for Russian iron.

Light Globes Make Ornamental Vases

From one of the new milk-white electric-lamp bulbs attractive little flower

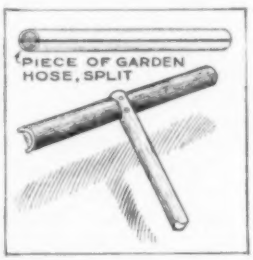


Ornamental Vases of Pleasing Size and in a Variety of Designs are Easily Made from Electric-Light Bulbs

vases are easily made. The neck of the bulb is scratched with a file, or glass cutter, and the brass tip removed by gently tapping it. The flame from a gas blow-torch is directed against the neck of the globe until the glass is red-hot, when the edge is formed into any of a variety of shapes by a forming tool made by driving a nail into a wooden handle and cutting off the head, as shown. After the edge has been formed, and the glass has been allowed to cool slowly, the flame is directed against the rounded bottom which is flattened after the glass becomes sufficiently heated. The resulting vases are ornamented as desired with oil paints.—Andrew Warmuth, Woodhaven, N. Y.

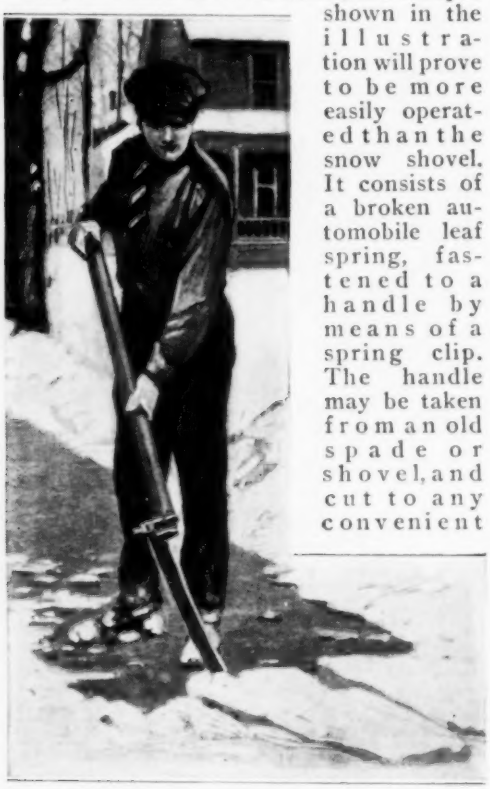
Garden Hose Makes Window Squeegee

An old broom handle and a piece of garden hose can be made into a squeegee, for scraping the water from windows without the necessity of wiping the glass with cloths, or for scraping water and slush from sidewalks. A piece of the broom handle is cut to a semicircular section and covered with a piece of garden hose which has been split in half and tacked to the wood. A suitable handle, as shown in the drawing, completes the tool.



An Efficient Ice Scraper

Where a heavy crust has formed on snow, or on ice-covered walks, the scraper shown in the illustration will prove to be more easily operated than the snow shovel. It consists of a broken automobile leaf spring, fastened to a handle by means of a spring clip. The handle may be taken from an old spade or shovel, and cut to any convenient length, and the rounded end of the spring should be the scraping point.



For Cleaning Walks of Crusted Snow and Ice, this Simply Constructed Scraper Is More Efficient than the Shovel

The blade, due to its narrow cutting face, and to its weight and length, will drive to a considerable distance under the crusted snow or ice, cleaving it loose in slabs, where a snow shovel would merely glide over the surface.—Judson DeGraff, Harrisville, N. Y.

Fuel Made from Balls of Paper Pulp

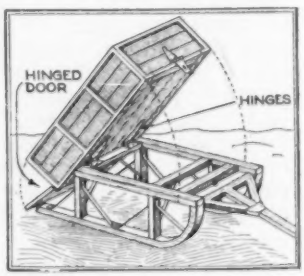
A good fuel can be made by pulping old newspapers and forming the pulp into balls. A tub, or other large receptacle, is filled with the papers and they are covered with water. If there is any tendency of the papers to float, a few stones will hold them under water. It is well to stand the container in the sun, as this will assist in reducing the material to pulp. The paper should always be kept covered with water; after three or four days it will be soft enough to form into balls about the size of both fists. The balls should be squeezed hard to extract as much of the water as possible, and the completed balls then set aside to dry. When all the moisture has evaporated, they will be almost as hard as wood and can be stored away for winter use.

Hints on Varnishing the Car

The average automobile owner, who uses his car every day, hesitates to lay up his machine for the period necessary to revarnish it. As a short cut to a serviceable job, the car is thoroughly washed at the end of a day's run, and the body is gone over with waste, soaked in turpentine, to remove any adhering wax or body polish. Then the car is gone over with a polish, composed of ½ pt. linseed oil, one-third as much turpentine, and a tablespoonful of drier. The car is then driven in this condition for two days, inasmuch as this treatment does not detract from its appearance, resembling only a body polish. At the end of the second day, the oil is hard and in good condition to serve as the foundation for holding a coat of varnish. Use only the best grade of varnish, diluted with half turpentine, and a small quantity of drier. If the varnish is applied in the evening, the car will be dry enough to drive on the following morning, without fear of picking up dust; if desired, a second coat may be applied two days later. If no second coat is to be applied, the varnish coat is rubbed down with finely powdered pumice and linseed oil, after the varnish has been allowed to dry on the car for at least three days.

Dumping Attachment for Box Sled

A dump sled for hauling manure, earth, and other bulk substances in the wintertime, can be built on a set of runners, as shown in the drawing. The dump body is attached to the runners with hinges, just a trifle back of the center of gravity, so that the body can be easily raised to the position shown. A hasp and staple, attached to the body and runners respectively, holds the former in a hori-



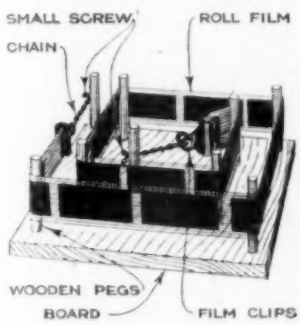
zontal position until the load is to be emptied.—J. G. Allshouse, Vandergrift, Pennsylvania.

Organ Stool as Child's High Chair

An organ or piano stool makes a convenient table seat for the child who has outgrown his high chair and is yet too small to use one of the regular chairs. The seat is removed from the stool, and in its place the back and seat of an ordinary chair are substituted; this arrangement makes a chair that with little effort can be adjusted to the height of its occupant.

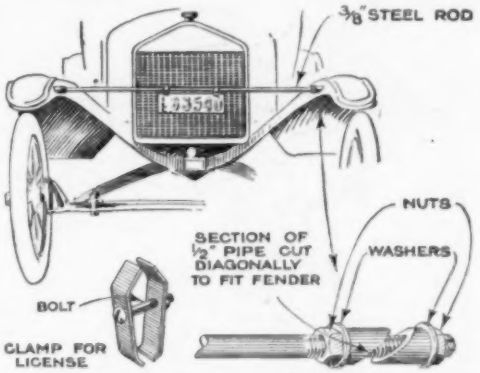
A Roll-Film Washer

The washing of roll films presents many difficulties, unless special apparatus is used, and for this purpose the washer shown in the drawing fills the bill to a nicety; it consists of a wooden base fitted with vertical wooden pegs, around which the film to be washed is wound. The size of the base is about 12 in. square and is drilled with ½-in. holes, into which the pegs, about 5 in. long, are driven, and secured with screws from underneath. A film clip is attached to the outside peg, and a small screw, or pin, is driven into the last peg, with about ⅛ in. projecting. A small chain, such as a key chain, is obtained, and one end of it is fastened to another film clip. A piece of iron or lead is fastened to the bottom of the device to keep it from floating. To use the washer, one end of the film is held in the outside clip, and the strip is wound around the pegs, as shown, the emulsion side, of course, being outward. The clip on the end of the chain is fastened to the other end of the film, which is drawn up moderately tight; then a link of the chain is hooked onto the screw, and the film is held in place. If the film is not quite long enough to go around, a few pegs may be missed and the film brought to the last peg. The washer is then placed in a vessel of water and the film washed in the usual manner. — William Underwood, Tunnel Hill, Ill.



Combined Fender Brace and License Bracket

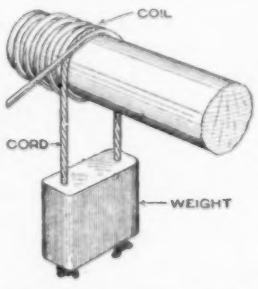
A great deal of the noise set up by light automobiles is the result of rattling fenders, which, even at moderate speed, make a horn so much excess weight. The drawing shows a fender brace that not only holds the fenders rigid but forms a convenient support for the license plate. A piece of ⅜-in. steel rod is threaded, for several inches, on each end and attached, through holes cut in the fenders, by means of nuts, washers, and pipe wedges, which are screwed up tight against both sides of the fenders, as shown in the drawing. Similar braces may be fitted to the rear fenders. Small metal clips, formed from ⅛ or 3/16-in. sheet metal and held together with stove bolts, are used for clamping the license plate to the brace.



Braces for Front and Rear Fenders of Light Automobiles Help to Reduce the Objectionable Noise of Rattling Sheet Iron

Spacer for Coil Winding

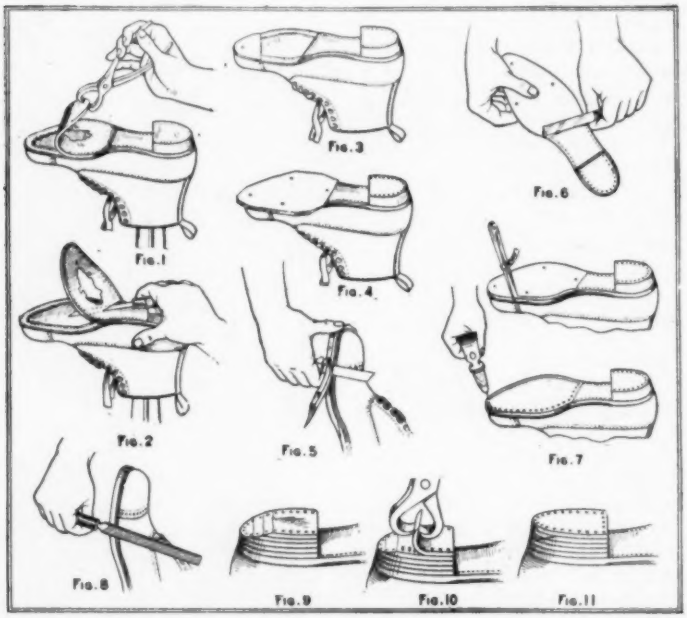
When winding coils for electric heaters, where the turns of wire are required to be evenly separated from each other, considerable care is necessary to make the separation uniform. A piece of cord, the same thickness as the space required between the turns, and a small weight are used to make the simple device shown in the drawing. Both ends of the cord are attached to the weight and the device is placed on the coil-winding mandrel, as shown, automatically spacing the turns.



How to Mend Shoes

BY FRANK M. RICH

EVERYBODY wears out shoes, and "by the same token" everybody ought to know how to mend them. The statement that shoe profits are "paper" profits only serves to confirm a lurking suspicion that paper is involved somewhere, a suspicion first engendered by the rapidity with which many shoes wear out. "Cobbling" is not high art but it is good economy, and he who has a pair of old shoes that can be renovated by straightening up the heels and adding new taps, or half soles, and does these things, contributes his bit toward reducing the cost of living.



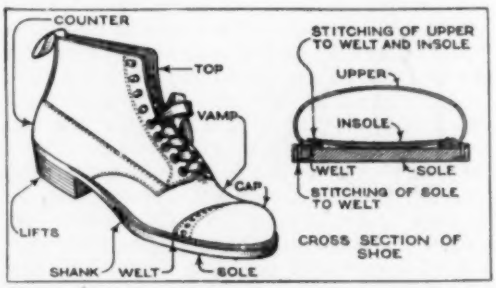
Almost Anybody can Learn to Do a Good Job of Shoe Repairing in a Short Time, and Even If One Is Not Naturally "Handy with Tools," the First Attempt will Be a Revelation. Figures 1 to 8 Show the Various Steps in Half-Soling a Shoe, and Figures 9 to 11 Show How Worn Heels are Repaired

An outfit of shoe-repairing tools and materials is simple and inexpensive, and the whole can usually be purchased for less than the price of a set of soles.

Before proceeding with the actual work, it is well for the "cobbler" to familiarize himself with the various parts of a shoe, as shown in the small drawing, after which he is prepared to tackle a job of half-soling.

First, the shoes are set on the leather and the new taps are marked out and cut a trifle larger than the old sole; these pieces are soaked for a few minutes in warm water, to soften the leather. While the leather is thus "mellowing," the old sole is removed, as in Fig. 1. Cut the thread with a knife, if the soles are sewed on, and, if the shoes have never been resoled, the worn sole is cut off at the shank, as in Fig. 2, paring the shank down to a thin taper or scarf, to make a neat splice with the new sole, which should be similarly scarfed. The leather is removed from the water and pounded on the last, evenly and thoroughly, with the hammer, to "harden" it. The shoe is then placed on the last and a piece of shoemakers' tarred felt, half the length and width of the sole, is placed under the sole to prevent squeaking. If the toe of the shoe has been worn down so that the welt is not in good condition, a tapering piece of leather is tacked to the toe to build it up, as in Fig. 3. The sole is fastened in place with four nails, as shown in Fig. 4. In nailing, the pegging awl is used to start the nail; the hole is not made too deep, just deep enough to hold the nail in position. The nails are not driven perpendicularly but with a slight slant toward the center, to hold the sole more securely.

After the sole has been tacked to the shoe as shown, the surplus leather around the edge is trimmed away, as in Fig. 5, so that it will be approximately flush with the sole; this is necessary so that the repairman will have an approximately correct outline to work from in order to get the nails in evenly. Figure 6 shows how the tap should be pared, or scarfed down,



A Study of the Component Parts of the Shoe is Suggested before Starting to Work

at the shank to make a neat joint at the point where the new sole laps over and joins the old one.

A line is scribed with a compass, or by other means, as indicated in Fig. 7, at a point from ¼ to ½ in. from the edge of the sole; this depends upon the size of the shoe and the width of the welt beyond the upper. Then awl holes are made at ½-in. intervals along the line, and the nails are driven in. Be sure the nails strike the last and clinch, and pound the heads down flush with the surface. If any nails bend over, withdraw them and put in new ones. Allow the leather to dry slowly, and then finish off the edge of the sole with a rasp, or a piece of broken window glass, which makes a good scraper. If a finer finish is desired, sandpaper can be used. After the soles have been finished the raw edges are coated with shoe polish to correspond with the color of the shoe.

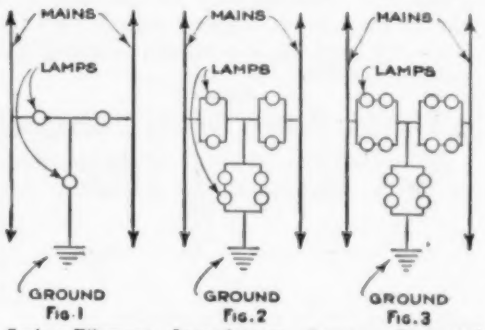
Normally most persons wear the heel off at the back, as shown in Fig. 9, while others walk so that the heel runs over at either side. In such cases the worn top pieces, or "lifts," as they are called, are removed, as in Fig. 10, and the projecting nails or pegs pulled out; then the heels may be built up of tapered pieces in the same manner as described for repairing a worn toe. These pieces serve to use up the odds and ends of leather. The small wedge-shaped pieces are tacked to the heel, and the bottom lift is applied in exactly the same manner as the sole, the finished job appearing as in Fig. 11. Of course there is no objection to removing all the worn lifts and replacing them with new ones, if leather is available.

Before the mended shoe is ready for wear, it is well to go over the nail heads with a file to take off any slight projections; examine the inside for nails and pound down thoroughly any projecting points or prominent clinches. A lining of thin leather cemented over the insole is desirable, especially at the heel.

Anybody can learn to do a good job of shoe repairing in a short time, and even if one is not naturally "handy with tools," but uses care in nailing and cutting, the first attempt will generally be surprisingly good.

Carbon-Lamp "Kick-Back" Preventer

To protect fixtures and house wiring from high-voltage "kick-backs," and to prevent the lights from blinking when using a wireless-transmitting set connected to the house current, a kick-back preventer is a necessity. Such a device may be made up of a number of carbon



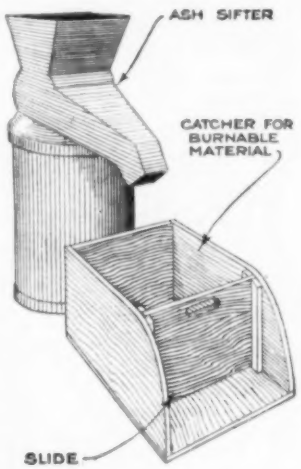
Carbon-Filament Incandescent Lamps, Connected across the Supply Line and Grounded at the Center, Protect against High-Voltage Surges from Wireless Transmitters

lamps connected across the power line and grounded at the center, as shown in the drawing.

Two carbon lamps are connected across the line, the connecting wire between the lamps being grounded through the third lamp, as shown in Fig. 1. This arrangement will give sufficient protection for low powers. In Figs. 2 and 3 are shown diagrams of preventers that have ample capacity for taking care of surge-backs up to the maximum voltage used by amateurs. Carbon lamps are used because they will carry heavy overloads.

Catcher for Ash Sifter

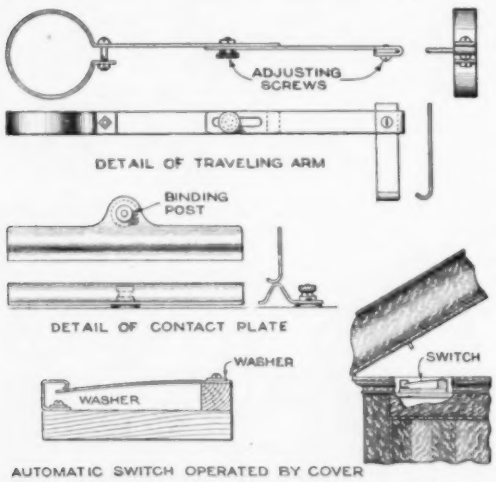
When ashes are sifted in the basement, the usual practice is to allow the reclaimed material to remain on the floor, where it drops from the sifter. The drawing shows an easily made receptacle, for the cleaned ashes, to be placed under the ash sifter. The box is substantially made of ½-in. wood, or an ordinary packing case of the desired size may be used by removing one end. Two strips are nailed on the inner surface of each side to hold a slide, which prevents the combustible material from



scattering over the floor. When the catcher is filled, the slide is lifted, and the reclaimed material may be shoveled into the furnace again without messing up the floor. — George Simonson, Springfield, Massachusetts.

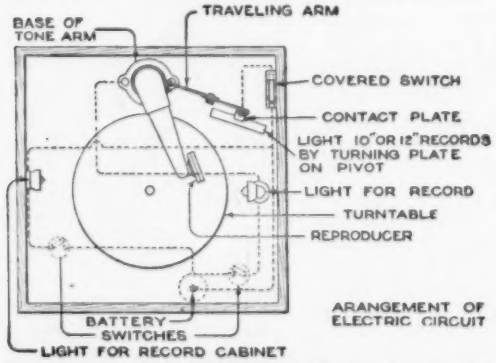
A Lighting System for the Phonograph

Operating the phonograph in the dark, or with insufficient illumination, frequently results in serious damage to a favorite, and possibly expensive, record, and it was to avoid this that the lighting arrangement described was worked out.



Detail Drawing Which Illustrates the Construction of the Traveling Arm, Contact Plate, and Automatic Switch: No Dimensions are Given, Owing to the Variations of Construction and Design of Different Machines

A traveling arm, shown in detail in the drawing, is attached to the tone arm of the machine. This arm is made adjustable for length, and is provided at its outer extremity with a very flexible contact spring, which closes the circuit and lights the lamp when the record is started. The contact plate, formed as shown, is attached to the bed of the machine, both the traveling arm and contact being adjustable so they will make a contact at the proper time for different-sized records. The binding post of the contact plate is an ordinary wood screw. A washer is placed between the plate and the machine to provide clearance, to permit its being turned as required. After this contact plate has been made and attached to the machine, the position of the traveling arm is set to make a contact when the needle in the reproducer is about ⅛ in. from the edge of the record turntable.



Wiring Arrangement Showing How the Lamps and Dry Cells are Placed with Relation to the Wires and Switches

The automatic switch, controlling the current, consists of a wooden base, to which a spring contact is attached that breaks the circuit when the cover is lowered, a lug being provided for opening it, as shown. The switch is attached to the body of the machine just inside the cabinet, and the wiring arrangement, which is clearly indicated, includes a light over the record cabinet, operated separately by its own switch.

When the cover of the machine is raised, contact is made in the automatic switch; then, when the needle is brought near the edge of the record, preparatory to playing, the traveling arm completes the circuit with the contact plate and lights the lamp, which goes out automatically after the first few grooves on the record have been played and the contact spring passes over the plate.—L. B. Robbins, Harwich, Mass.

Making Bright Prints from Underexposed Negatives

Bright prints may be obtained from negatives which are usually regarded as too thin, by the following method:

Expose the print in the usual way, exposing rather longer than usual, then develop for a longer period than customary, until the final result is very heavy, the picture appearing buried. It is fixed, and well washed, and is then placed in a reducer made by dissolving 60 gr. of potassium iodide in a pint of water, and, when dissolved, adding 6 gr. of iodine. Placed in this solution, the whole paper of the print turns blue-black, and the image itself reduces rapidly. The reduction must not be allowed to go too far, however, and the print is then rinsed and placed in clean hypo. This turns the paper white, and dissolves any silver iodide, leaving a vigorous print. A thorough wash completes the operation. It

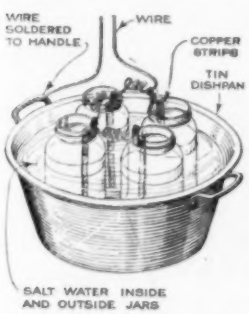
is better to reduce too little than too much, as the latter is irremediable, whereas the former can always be corrected by a second treatment.—H. J. Engel, New Braunfels, Tex.

Improving Gas Mantles

Gas mantles may be greatly improved, both as to durability and illuminating power, by immersing them in vinegar. A cup is filled with ordinary vinegar, in which the new mantle is suspended for 10 minutes. It is then hung up to dry, after which it is ready to be fitted to the burner in the usual manner.

Emergency Wireless Condenser

While operating a high-frequency set, an amateur wireless operator had the misfortune to burn out his condenser. Desiring to resume operation as soon as possible, he assembled the emergency condenser shown in the drawing. An old tin dishpan was obtained, and four ordinary fruit jars were set in the pan, which was filled to within about 2 in. of the top with strong salt water. Each jar was also filled with salt water to the same level. Then a copper strip was placed in each jar and a connection made to each strip, the other wire being connected to the tin pan. This makeshift condenser was found very efficient and was used for several months. As the water evaporated, a fresh supply was added from time to time.—Hubert Griffiths, Montreal, Que.

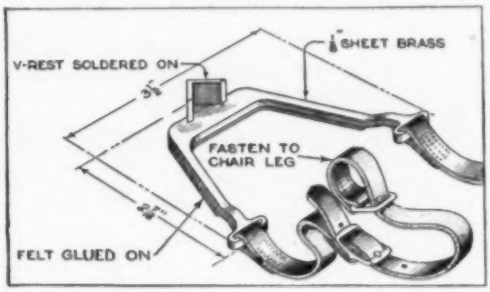


Pipe Cleaner for Fountain Pens

Ordinary pipe cleaners, which may be purchased at practically all cigar stores, are suitable for cleaning fountain pens. Syringing the barrel of the pen with water will remove partly dried ink, but it is difficult to shake out all the water after this operation, and usually enough will remain to dilute the ink to such an extent that the writing will be faint. If the barrel is swabbed out with a pipe cleaner after the syringe is used, this difficulty will be overcome. The cleaners cannot be used with self-filling pens that are equipped with soft-rubber ink sacks.

Simple Device Prevents Support Rod of Cello from Marring Floor

Players on a violoncello are frequently hard put to prevent the support rod of their instrument from marring finished

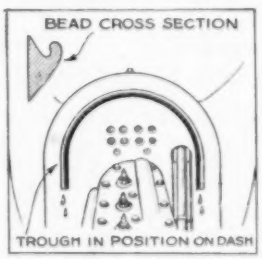


A Device for the Violoncello Player That Makes It Impossible for His Instrument to Slip or Mar the Finest Polished Floor

floors, and slipping on the polished surface. The device shown in the drawing provides a rest for the support rod and prevents the instrument from slipping. A piece of ⅛-in. sheet brass is cut to the form shown, and an upright V-shaped piece is soldered, or brazed, to the front; a piece of felt is fastened to the underside of the sheet brass, with shellac, to prevent damage to the floor finish. An adjustable leather strap is sewed into each of the eyes provided in the brass piece, and these terminate in adjustable loops, as shown. In use, the loops are placed over the front chair legs, with the metal part on the floor at the required distance in front of the chair. The end of the support rod is placed against the V-shaped projection, from which it cannot be removed accidentally.—Edwin A. Elliott, Brooklyn, N. Y.

An Eaves Trough for the Light Car

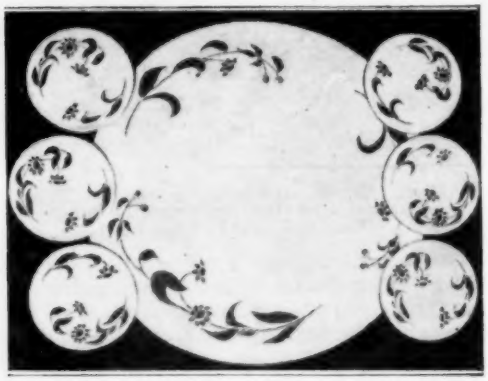
A well-known light automobile has the objectionable habit of "quitting cold" when rain runs down the cowl, under the hood, and short-circuits the ignition coils. To eliminate this trouble, an eaves trough, made from a section of the bead from an old clincher tire, is tacked onto the dash just beneath the hood. The cross section of the bead forms a natural trough with sufficient capacity and curvature to carry off all the water that finds



its way underneath the hood. A thin coating of rubber cement along the line of contact with the dash will prove of additional value and dispense with the necessity of using so many tacks.

An Oilcloth Luncheon Set

A pleasing luncheon set, that is lasting and requires no laundering, can be made of oilcloth, hand painted in oil in some



Disks of Oilcloth Decorated in Contrasting Colors Make a Pleasing and Sanitary Covering for the Dining Table and do Not Require Laundering

conventional design. Circles of various size are laid out on the cloth with a compass, those shown in the engraving being 8 in. and 36 in. in diameter, respectively. After the circles have been cut from the piece, the design is marked on the face of the pieces; this is accomplished by laying out the design on tissue paper and transferring it to the oilcloth by tracing. Then the lines are filled in with oil paints of the proper color. The paints can be obtained at paint and art-goods stores in small tubes. The colors should be mixed rather thin with turpentine, and should not be applied too heavily. For the daisy design illustrated, two shades of yellow and two shades of green were used.—Mrs. Jessie S. Hawthorne, Maywood, Ill.

Making Photographic Name Plates

Name plates or signs with gold or silver lettering on a black ground may easily be made by the photographer in the following manner: The wording is first very carefully drawn in pencil on a sheet of white cardboard, and neatly blocked in with India ink. The design is then photographed to the size desired. The negative, which has transparent letters on a dense black ground, is then painted on the film side with gold or silver paint; it can be covered with glass and framed or mounted in any manner required.

Soap Molds for Plaster Patterns

Plaster patterns for small metallic castings are easily made in soap molds which are quite easy to make. Ordinary laundry soap, in bars, that will stand cutting without breaking or cracking, is used for the purpose. The bars of soap are squared off at the sides so that the necessary number may be stuck together, to form a single piece of soap without hollows, or other depressions. Moisten the edges that are to be joined with hot water and press together firmly. When the joints have set well, the mold is carved out of the soap with a knife, or other tool. The plaster pattern is made by filling the soap mold with plaster of Paris mixed with water. After the plaster has thoroughly dried, it is removed from the soap mold and placed in the sink, where any adhering soap is washed off. When the plaster pattern has dried, it is given a coat of shellac; it is then ready for making the sand mold in which the casting is to be poured.—R. L. Ogden, Denver, Colo.

Hand Warmer Made from Mustard Can

A mustard can, of a convenient size, may be used for making a hand warmer. After the label has been removed from the can, a row of holes is made near the bottom edge and several holes are made in the lid. The inside of the can is lined with asbestos paper, held in place with water glass, or sodium silicate; the outside is similarly covered with the exception of the lid; the holes should not be covered up. In use, the can is partly filled with powdered charcoal, and one corner is lighted with a match. Allow the fuel to smolder for a few minutes until the fire spreads across the top; then replace the cover. Such a heater can be carried in the pocket and will retain its heat for several hours.

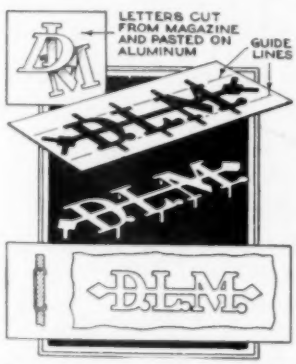
¶Benzine will remove chewing gum from rugs or clothing.

Keeping the Runner in Place on the Porch Table

It is difficult to keep the runner on the porch table in place when the wind is blowing, but the following method will keep it in position in anything short of a gale: A narrow facing, about ½ in. wide, is stitched on each end of the runner just above the hem or trimming; one end of the facing is left open, and a rod, slightly shorter than the width of the runner, is slipped into it. The rod will hold the cloth straight and smooth, and is easily removed when the runner is to be laundered.

Aluminum Monograms for the Automobile

An aluminum monogram makes a neat and attractive mark of identification for the automobile, and is easily cut from the sheet metal with a pair of shears.



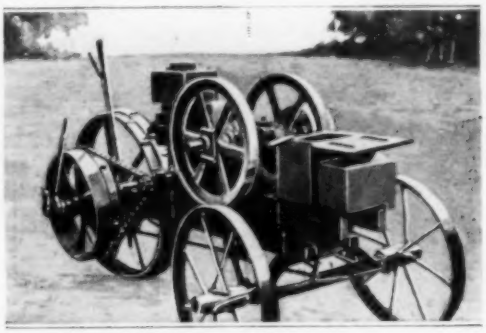
Letters of the style desired are cut from the pages of a magazine and pasted to the face of the metal, to serve as a pattern; after the monogram has been formed, the paper letters are easily soaked off. For attaching the monogram to metal-door panels ears are required at the top and bottom; these are inserted into slots cut in the panel, and bent over, as indicated in the drawing. If the panel has a wood backing, holes are drilled in the monogram and it is attached with small nails, the heads being filed flush. An ordinary pocket-knife and three-cornered file are useful for removing rough edges, and for finishing the letters.

Hot Water Aids in Removing Slivers

To remove slivers, fill a small bottle with hot water; then place the spot containing the sliver over the mouth of the bottle and press down, so that the part is held close. Unless the sliver, or splinter, is a very large one it will come out of itself after a few minutes of this steaming. The heat from the steam also serves to relieve the wound of much of its soreness.

Making a Stationary Engine Propel Itself

Alternate jobs for the stationary engine, first at the well, in the pasture, and then



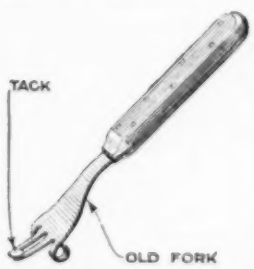
Loading Even a Small Stationary Engine for Transport to Different Jobs Was Too Bothersome for This Farmer, So He Made the Engine Haul Itself

at the barn, a half mile away, prompted the farmer owner to rig the engine up so that the necessity of loading and unloading it into a wagon for each trip would be eliminated.

The photograph shows at a glance the details of this arrangement. The power of the engine is conveyed to the old mower wheel at the rear which provides traction. To the shaft of the rear wheel, a clutch pulley is keyed. The inner periphery of this is provided with studs that serve as gear teeth and engage with the link chain, to which power is delivered through a horizontal jackshaft connected to the engine pulley by a short belt. The engine is steered by manipulating the long lever shown, which is connected to the front axle by iron rods.

Old Fork Makes Tack Lifter

The drawing shows how an old fork can be converted into a simple and effective tack lifter. A four-tined fork is required for the purpose, and the tines are cut off to leave them about ¾ in. long; the outside tines are bent back underneath, as shown, to provide a fulcrum for the lifter, and the two center tines are filed off a little on the underside of each end so that they may be easily inserted underneath the tack heads.—C. A. Black, Jr., Hightstown, N. J.



Desk Made from Old Organ

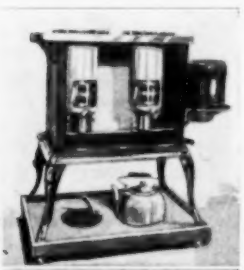
A paraphrase on a familiar advertising slogan might be: "Have you an old organ

An Attractive Writing Desk is Made from an Old Organ. The Reed Box at the Top is Made into a Secret Compartment. The Writing Table was Built Over What Was Once the Keyboard

in your home?" One man had not only one but two of them, both mute as the tomb. By combining parts of the two organs he made one good instrument and converted the other into a writing desk, or secretary, as shown in the photograph. After removing the "works" from the old organ, a flat writing table was built over the former location of the keyboard. The top, which contained the reeds and pipes, was made into a secret compartment.—Oden Liljegren Fern, Pasadena, Calif.

Making the Oil Stove Portable

A wheeled platform is an added convenience for users of oil cookstoves in localities where gas is unavailable. As shown in the photograph, a strip is nailed around the edges of the platform to hold the stove in position, and the casters elevate it above the floor so that the cook's toes do not come in contact with it. Such a platform makes a convenient place for keeping the cooking utensils and accessories most often used.

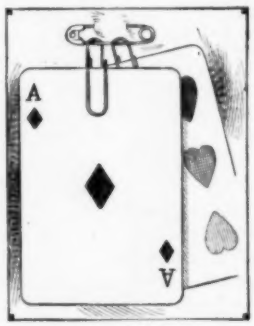


How to Make a Slow-Acting Relay

The electrical experimenter will often find a slow, or delayed-action, relay valuable when building electromechanical remote controls, and many forms of automatic systems. The size and type of relay will be determined by individual needs. The wire is unwound from the relay coils and one layer of insulated, heavy copper wire is wound on each core. Holes are made in the flanges, and the ends of these heavy windings are brought out at each end. The regular magnet wire is rewound over the heavy winding on each coil, care being taken to see that the wire is wound on the separate coils in opposite directions; the magnet windings are connected as they were originally. The heavy windings are short-circuited by uniting the ends on the outside of each coil; this is done to prevent leaving a hump in the coils, when they are rewound. The relay has now been made slow-acting, and when current is applied to the active winding, the armature will not respond instantly, but hesitates for the fraction of a second before it closes.—C. M. Crouch, Minneapolis, Minn.

Paper Clips Make Magician's Card Holder

A quickly arranged card holder, for performers of magic and legerdemain, is found in the ordinary wire paper clips obtainable at any stationery store. These clips are sewed to the lining of the clothing, or held by means of a safety pin, in the manner shown in the drawing. A great number of cards can be held "in reserve" by this method, and while held securely, they may be drawn with only the slightest effort.—Elmer O. Tetzlaff, Milwaukee, Wis.



Leggings Made from Boot Tops

Many hunters and others cannot wear rubber boots on account of the discomfort of perspiring feet. Those who desire to wear shoes and still have waterproof protection for their trousers and legs, when walking through wet grass, may do so at slight expense. The feet are cut

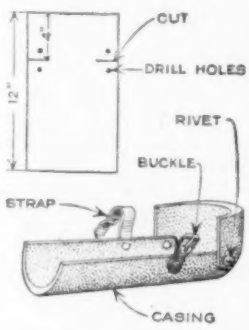
from a pair of old boots at the ankles, and the tops are worn as leggings. First, slip on the boot tops over the trousers, and then put on and lace the shoes. The boot tops slip down snugly against the shoes, keep out burs and other weed seeds, and keep the trousers dry and the legs warm.—Thaleon Blake, Sidney, Ohio.

Tire Tape Repairs Clothes

The motorist and cyclist often meet with accidents that result in torn garments at some conspicuous location. However, as they usually carry with them a supply of adhesive tire tape, the torn spot can be patched up by applying the tape to the edges of the tear on the underside of the cloth.

Knee Pads Made from Auto Casing

Persons whose work requires them to be in a kneeling position much of the time, such as carpet layers, concrete workers, etc., will find that a substantial, durable, and waterproof pair of knee pads can be made from old automobile casings, as shown in the drawing.



A 12-in. length is cut from an old casing, and about 4 in. from the end, two 1-in. slits are made at each side. The short end is then bent up, as shown, and riveted into place. A suitable strap and buckle completes the job.—Truman McNiel, Seattle, Wash.

Tables on Casters Make Moving of Washtubs Easy

By mounting small tables on casters, as illustrated, much of the back-breaking work associated with washing day is banished. The wringer can be mounted on the taller table and the clothes passed into the tub on the lower one, which is then wheeled out to the line.—Mrs. R. D. Shultis, Greeley, Colo.

Cleaning the Auto with Sprayer and Air Tank

The motorist who owns a sprayer of the type illustrated can make good use of it for washing his car, thus applying

A Compressed-Air Sprayer need Not Remain Idle Where There Is Car Washing to be Done

"machine methods" to one of the most disagreeable of the tasks of car keeping. The sprayer is provided with the usual two lengths of rubber hose; one leads to a compressed-air tank, while the other dips into a jug filled with the cleaning fluid. Such a fluid may be water, a mixture of water and gasoline, or some other of the liquids in common use for car cleaning.

Designs Produced by Phonograph

The revolving record table of any phonograph provides a means of making excellent freehand designs. A circular disk of soft wood, the same size as the table, is made, and provided at the center with a hole for the motor shaft; this disk should be thick enough to come flush, or a little above, the top of the shaft. To the wooden disk a sheet of paper is attached with thumbtacks, and the table is set in motion. With a pencil, make a number of reciprocating, circular, elliptical, or other movements from the center toward the edge of the paper, then stop the machine and observe results. With a little practice, and by using different movements and positions of the pencil and varying the length of the movements, an unlimited variety of complicated and pleasing designs can be produced. The pencil should not be pressed against the paper too heavily, or the table will stop and spoil the design.—H. R. Howie, Swansea, Ont.

A Novel Lily Pond

In order to provide open water in a lily pond for his children to sail their toy

In Rebuilding His Lily Pond the Owner Installed a Central Root Bed and Bird Bath. As the Lilies Grew from the Center of the Pond, a Margin of Open Water was Left for the Children's Boats

boats, the owner drained off the water and made some radical changes in its construction. Originally the lily roots were planted indiscriminately in the mud at the bottom of the pond, and soon the plant growth completely covered the surface of the water. After the pond had been thoroughly cleaned, a circular concrete root bed was made in the center of the pond. This was accomplished by using a sheet-metal form made by riveting the ends of strips of sheet metal together. As the outer part was larger than the inner one, small blocks of wood were placed between the two to hold them a uniform distance apart, and the space was filled with concrete. After it had set, the center was filled with earth, and the lily roots replanted.

While the pond was being rebuilt, it was decided to add a bird bath; this was made by forming a square lump of cement on a rough board platform. The platform was mounted on a piece of pipe that projected through the mass of concrete; the bottom end of the pipe was set over a pin in such a way that the platform could be revolved. When the cement mixture had set to the proper consistency, all projecting corners were turned off with a hatchet blade while the table was revolved. The bath was then turned over and the inside hollowed out in the same manner, the operation being similar to turning a round wooden shape on a lathe. When the bowl was hard, the pipe was removed and a nipple substituted. Flanges were screwed down over the nipple, inside and outside, to make a water-tight joint and were plastered over with cement. The top of the nipple was covered with a pipe cap drilled with small holes, to make a fountain when connected to the water-supply pipe, as shown. In the completed pond all the lily stalks grew from the center, and consequently the water about the edge was left open for the children's boats.

Eggshell Makes an Emergency Funnel

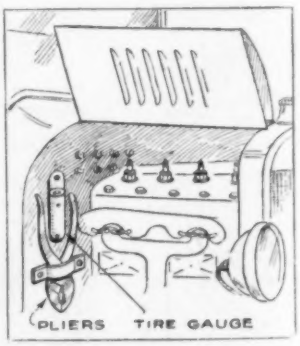
When it is desired to fill vinegar cruets, or narrow-necked bottles, and a funnel is unavailable, one can be improvised from an eggshell. The shell should be quite dry and a small opening is made at the bottom. Stand the shell so that the hole is well over the opening of the container to be filled, and proceed as with a regular funnel.

A Handy Fishing-Rod Rest

The usual practice of sticking the butt of the fishing rod into the earth is open to the serious objection that the handle is covered with mud and dirt. A much better arrangement, for resting the rod while the fisherman is waiting for a "strike," is made from two forked branches, as shown in the drawing. The ends of the branches are pointed and pushed into the earth about 2 ft. apart.—Chester Cooper, Glenville, W. Va.

Small Tools Carried under Auto Hood

When the motorist searches for his pliers, tire gauge, or other often-needed tool, under the seat, or in a tool box filled with a miscellaneous assortment of old rags and other rubbish that the average automobile owner is wont to keep among his tools, his exasperation is not lessened by the fact that he has himself to blame. The tire gauge and pliers, the former in its case and the pliers hung in a leather strap, are made conveniently accessible by attaching them to the back of the dash, underneath the hood, as shown in the drawing.



CHUMS TAKE CRIPPLED GIRL FOR OUTING IN WHEELBARROW

WHEN a party of several hundred young people set out on an expedition into the Eagle Creek Cañon, a forest reserve on the Columbia River, the party took with it, on a wheelbarrow, a crippled girl friend. The young woman, who is a paralytic, had never been outside the limits of her native city. As the trail was too narrow for any other kind of vehicle a wheelbarrow was used to carry the passenger, who rode in perfect comfort, seated on a pile of cushions. With the aid of lead ropes and a member of the party between the handles of the barrow, she was trundled for miles up the mountain trail.

OPPORTUNE ANNOUNCEMENTS

Whenever prize competitions mentioned on this page are conducted by a public institution, the name and address will appear with the announcement. Industrial addresses will not be published, but may be obtained from our Bureau of Information by request, mentioning the title of the article and date of publication.—Editor.

POST-GRADUATE STUDY ALLOWED EMPLOYES OF BIG PLANT

Engineering-department employes of a large electric manufacturing plant in the East are now privileged to pursue post-graduate courses at Columbia University, by virtue of a new coöperative arrangement. Office hours and salaries of those who elect to work for a master's degree are adjusted to the needs of the classroom, and the course may be completed in two years. Candidates are nominated by department heads from among more than 3,000 eligible technical men employed at the plant, and admission is then dependent upon the usual academic requirements. Some qualified members of the staff are working for doctorates at the university, while a nine months' course of practical training in the plant itself has been arranged for the graduates employed there.

RURAL-ENGINEERING DRAFTSMEN FOR GOVERNMENT SERVICE

Draftsmen experienced in the design of farm structures now have opportunity to enter the service of the U. S. Department of Agriculture, if they get their applications in by October 12. The examination calls for a rural engineering draftsman, at $1,800 to $2,200 a year, plus $20 a month emergency increase.

Actual drawings submitted count 40 per cent in the applicant's rating; education, experience, and general fitness for the work making up the other 60 per cent. The usual civil-service requirements govern the application, which should be made on form No. 1312, the request for the form specifying the title of the examination desired.

SCHOOLS ABOLISH LANGUAGE STUDY TO GAIN TIME FOR TECHNICS

Study of modern languages has been eliminated as a requirement of engineering courses in two large technical schools, one on the west coast and the other in the East. The time formerly given to these essentially cultural branches is now devoted to electrical and mechanical subjects, thus removing the technical courses one step farther from the classical. The desire of technical graduates to get into practical work as soon as possible, and with the most thorough training, is responsible for the innovation.

MANY PAMPHLETS AID BOY SCOUTS TO SECURE MERIT BADGES

A series of 67 pamphlets, covering as many distinct subjects, has now been prepared by the national council of the Boy Scouts of America, to guide first-class scouts in the work of earning merit badges. The topics treated range through the alphabet, from Agriculture and Angling to Taxidermy and Wireless, but the purpose of the work is not so much to give complete instructions in these arts as to interest the student in practical means for securing the desired information.

¶ Sociability among wireless amateurs, a program of outings and visits to points of interest, and coöperation in developing the usefulness of amateur radio work, are the purposes of the Bedford Radio Club, recently organized in Brooklyn, N. Y. Beginners in wireless are also to be offered a three months' course of instruction, according to the present plans of the club. A local branch of the Young Men's Christian Association is sponsor for the organization.

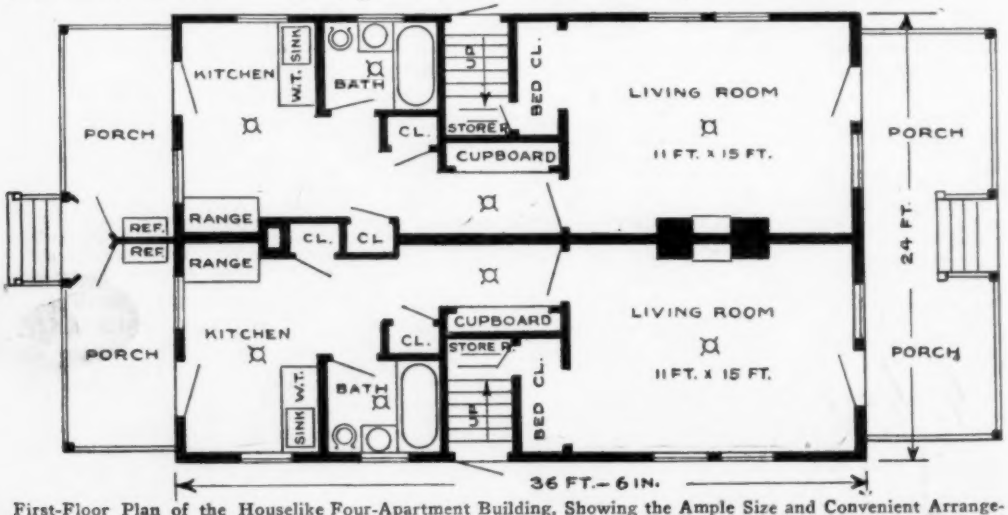
FOUR-APARTMENT BUILDING LIKE PRIVATE HOUSE

A Four-Apartment Building That Resembles and Is No Larger than an Ordinary Private Dwelling: Each Apartment Contains Two Rooms, Those on the Second Floor being Entered at the Sides

IN the past few years there has gradually come about an astonishing reduction in the number of rooms necessary to the comfortable living accommodation of the average family. Necessity and invention have joined hands in producing this result, the universal dearth of housing facilities forcing an economy of space, while ingenious built-in features have contributed to a single room the functions of several. Now it is entirely possible to conduct all the normal affairs of a home in two rooms.

Since four apartments of two rooms each make a total of but eight rooms, such a group need occupy only the space of an ordinary house, and architecturally may be made to resemble a private dwelling as closely as desired. A building of this kind, designed by an Illinois architect, has two apartments on the first floor and two on the second, all facing the street, with windows on two sides of each room and capacious front and rear porches. Entrance to the lower apartments is by way of the front porch and living rooms, while the upper apartments are entered by side doors and inside stairs.

The whole building measures, without porches, only 24 by 36½ ft., yet the living rooms, all alike, are 11 by 15 ft., and each contains a bed that disappears into a ventilated closet. The bathroom has standard equipment, and the kitchen is fitted with gas range and a combination of sink and laundry tubs, the sink drainboard forming the cover for the tubs. The rear porches and upper front porch are partitioned, and the latter may be used for sleeping. Using soft-wood trim, it is estimated that such a building would cost about $5,000 in the smaller cities.



First-Floor Plan of the Houselike Four-Apartment Building, Showing the Ample Size and Convenient Arrangement of the Rooms: The Second-Floor Plan Is Similar, except That the Front Porch Has No Street Entrance

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